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Temperature in Roasting Gold Ore.

BY WILLIAM E. GREENAWALT.

The regulation of temperature in a furnace to get the best results in roasting gold ores depends largely on the nature and composition of the ore. Except on ores containing much sulphur, slow initial heating is not essential, if care be taken not to carry the heat to the sintering point. Even on concentrate and ore high in sulphur, the initial temperature may be reasonably high without showing any deleterious effect, providing the rabbling is sufficiently frequent. When roasting ore in large furnaces, the rear fire-box may be pushed quite as hard as the first one, since the temperature of the ore must be brought to the ignition—or to the volatilization—point of sulphur, before roasting can begin. This fact was demonstrated some time ago by comparative tests made in roasting Cripple Creek ore, in four 100-ton furnaces. Three of these furnaces were of the ordinary type; the fourth had a revolving hearth, which was so fired that the temperature through the entire hearth was practically the same. The raw ore entering the furnace was subjected to almost the same heat as the roasted ore being discharged. A comparison of several thousand tons of tailing from the different furnaces showed no material difference in the extraction.

The ordinary roasting starts with a low initial heat, and finishes at the highest temperature the ore will stand without sintering. While this may be the best for some ores, my own experience would indicate that it is well to bring the ore as quickly as possible to a dull-red (or even a cherry-red) heat, and that the finishing temperature should not be too high. In roasting ore containing from 2% to 4% sulphur (in a furnace having, say, four fire-boxes, and roasting 100 tons per day) the best result will be obtained by firing the finishing box at a lower temperature than the one preceding it. The dark magnetic oxide of iron is, to a large extent, converted into the red ferric oxide by prolonged roasting at a moderately low temperature. If the ore is overheated (as is frequently the case when the finishing heat is high) it has a dark appearance; whereas if finished at a lower temperature, the ore will have the red appearance of ferric oxide. Over-heating, or lack or air, will convert the ferric oxide into the magnetic oxide, which, at a lower temperature and with an abundance of air, may be reconverted into the ferric oxide.

In order to determine the effect of temperature on the extraction, the following laboratory experiments were made on Cripple Creek ore. Chlorine was used as the solvent. Head assay of raw ore, gold, 5.32 oz.; head assay roasted ore, gold, 5.56 oz.; sulphur, 4.02%.

Test No. 1.—The ore was given what appeared to be an ordinary roast, in an assay muffle. The finishing heat was that ordinarily given in the large furnaces. The ore did not show any sintering. Sulphur in roasted ore—soluble, 1.16%; insoluble, 0.26%; average tailing from 10 bottle-tests, 0.50 oz.; extraction, 91%.

Test No. 2.—The ore was given a prolonged roast to reduce the sulphur content. The finishing heat was quite high (about 1,575° F.), but the ore was not sintered. Sulphur in roasted ore—soluble, 0.90%; insoluble, 0.10%; average tailing from 10 bottle-tests, 0.33 oz.; extraction, 94%.

Test No. 3.—The ore was roasted at a high heat, and finished at a very high temperature (about 1,650° to 1,700° F.); it had a dark appearance and was slightly fused. Sulphur in roasted ore—soluble, 0.34%; insoluble, 0.09%; average tailing from 10 bottle-tests, 1.23 oz; extraction, 78%. Two bottles were re-charged and treated 12 hours; re-charge tailing ran 0.79 oz.; extraction, 86%.

Test No. 4.—The ore was roasted 10 hours in the muffle. It was brought quickly to a red heat, and finally finished at a moderately high temperature. The ore had a dark appearance, and the finer particles were very slightly fused. Sulphur in roasted ore—soluble, 0.75%; insoluble, 0.11%; average tailing from 10 bottle-tests, 0.73 oz.; extraction, 88%.

From tests 3 and 4 it is evident that if the ore is fused or sintered a close extraction is impossible.

Test No. 5.—The ore was roasted 5 hours at a very low temperature (scarcely visible red); it was then taken out of the muffle and divided into two equal parts. One-half was returned to the muffle and roasted 8 hours longer at a low dull red heat. The finishing heat was a dull red. The entire roasting was performed at a prolonged low heat. Sulphur in roasted ore—soluble, 0.74%; insoluble, 0.25%; average tailing from 10 bottle-tests 0.15 oz. Extraction, 97.3%.

Test No. 6.—The other half of the ore taken from No. 5 after roasting 5 hours, was then put into the muffle and roasted 5 hours more and finished at a higher temperature. The ore was not fused or sintered. Sulphur in roasted ore—soluble, 0.69%; insoluble, 0.24%; average tailing from 10 bottle-tests, 0.48 oz. Extraction, 91%.

In the bottle-tests for the different roasts, the conditions were kept the same. The chemicals corresponded to 15 and 20 lb. of bleach, and 30 and 40 lb. of sulphuric acid, per ton of ore. The time of treatment, on account of the high-grade of the ore, was 5 hours. The ore was crushed to 16 mesh.

It will be noticed that the best results were obtained from No. 5, where the finishing heat was moderately low. By increasing the heat, the extraction was not improved, as shown by No. 6. In No. 1, the ore was not roasted sufficiently, as indicated by the sulphur analysis of 1.42%. In No. 3, the ore was roasted at too high a temperature; the sulphur content is low, 0.43%. The sulphur in No. 2 represents more nearly the mill roast. For ore having 4% sulphur, the soluble and insoluble, as represented by No. 2, might be considered normal for Cripple Creek ore. A prolonged low heat, as represented by No. 5, will give the best average extraction. The conditions there represented, however, could probably not be fully realized in practice, on account of the reduced capacity of the furnaces.

These tests were repeated in large furnaces roasting 100 tons of ore daily, and each test represents a day's run, or 200 tons. The extraction is based on the mill tailing. Furnace No. 1 was fired with a low initial heat and a high finishing heat. Furnace No. 2 was fired with a higher initial heat and a lower finishing heat. Care was taken to get the best possible roast under both conditions.

	Furn. No. 1	Furn. No. 2.
FURNACE TEST NO. 1.		
Sulphur raw ore	2.75%	2.50%
Sulphur roasted ore, soluble	0.75%	0.79%
Sulphur roasted ore, insoluble	0.09%	0.14%
Assay of roasted ore, gold	1.05 oz.	1.85 oz.
Assay of chlorination tailing	0.08 oz.	0.11 oz.
Extraction	92.4%	94.6%
FURNACE TEST NO. 2.		
Sulphur raw ore	2.66%	2.66%
Sulphur roasted ore, soluble	0.85%	0.85%
Sulphur roasted ore, insoluble	0.07%	0.12%
Assay of roasted ore, gold	1.18 oz.	1.09 oz.
Assay of chlorination tailing	0.078 oz.	0.071 oz.
Extraction	93.4%	93.5%
FURNACE TEST NO. 3.		
Sulphur raw ore	2.45%	2.63%
Sulphur roasted ore, soluble	0.71%	0.77%
Sulphur roasted ore, insoluble	0.05%	0.18%
Assay roasted ore, gold	1.10 oz.	1.99 oz.
Assay of chlorination tailing	0.11 oz.	0.125 oz.
Extraction	90%	93.7%
FURNACE TEST NO. 4.		
Sulphur raw ore	2.66%	2.66%
Sulphur roasted ore, soluble	1.03%	0.79%
Sulphur roasted ore, insoluble	0.07%	0.08%
Assay of roasted ore, gold	1.23 oz.	1.11 oz.
Assay of chlorination tailing	0.12 oz.	0.07 oz.
Extraction	90%	94%

These comparative tests in actual mill practice, in furnace-roasting 100 tons of ore per day, are characteristic of numerous other tests made on the same lines. The results clearly indicate that the lower finishing heat gives the best average results. The ore was crushed to 10 mesh. Time of chlorination, 3 hours. The chemicals used were 15 lb. of bleach, and 30 lb. of acid per ton of ore.

At Tacoma, Wash., there is a concrete chimney 307 ft. high. The base is 39½ ft. square, the inside diameter is 18 ft., and the largest outside diameter 21 ft. The chimney is built double to a height of 90 ft.; the outer shell is 9 in., the air space 5 in., and the inner shell 4 in. The single shell above this is 7 in. thick. The chimney was built in 3-ft. sections, with a network of T-steel in the base and vertical steel T-bars in the shell encircled by rings of the same.

Prospecting With Churn Drills.

BY GEORGE C. MC FARLANE.*

There are two general types of churn drills used in putting down deep holes. In the solid-tool type the cutting bit, backed by a heavy stem and a pair of slips or jar links, is jumped by a line of wooden poles or by a cable, and the cutting removed periodically by withdrawing the drilling tools and lowering a sand-pump or bailer. Solid tools give a very imperfect record of the strata passed through, and are used principally in boring salt, oil and water wells.

In the hollow-tool type of churn drills the cutting bit is screwed into a line of rigidly connected gas-pipe drill rods, and the drill cuttings are brought to the surface continuously, either by washing them up with a stream of water (forced down the drill rods), or they may be pumped up through the drill rods by placing a ball valve over the drill bit, sufficient water for the purpose being poured into the hole at the surface.

Gas-pipe tools are used extensively in prospecting for coal, clay and other minerals, where the rock-formations are comparatively soft.

Several excellent machines are on the market. They consist of a derrick and a spudding-and-hoisting mechanism, driven by a 4- to 8-h.p. gasoline-engine, or by a small steam-engine and boiler, the whole being mounted on wheels. The drilling tools consist of a tool-steel drill, with a hole bored in the top to intersect two holes drilled from the sides. The bit is screwed to a length of double-extra-heavy gas-pipe, the balance of the rods also being extra-heavy gas pipe. A swivel and hose are attached to the top of the rods, the bail of the swivel hooking on to the drill rope. A steel or brass ball is placed over the hole in the drill. Water is allowed to run down the hole, and the motion of the drill causes the water and cutting to be pumped up the rods and discharged through the hose into a box fitted with a fine brass screen, where the cutting can be caught and examined by the drill operator. The cutting may be also jetted out by pumping water down the drill rods.

As between the jetting system and the self-pumping system, there is usually little choice. If there is much water in the strata, the cutting cannot be jetted, as the hole will drink the water as fast as it can be pumped down. Ordinarily, however, a hole will drink only a small fraction of the wash-water; and, in such cases, I would prefer to use the jetting system, for the reason that the churning of the rods rubs off a certain amount of the material from the sides of the hole, which, of course, comes up with the cutting.

Suppose we were drilling through a coal vein. Using the jetting system, 30 or 40 strokes of the drill on bottom would drill 4 inches; the drill would then be stopped until the cutting is washed up. Using the pumping system, the tools would have to be run, say, 100 strokes more on the spring of the line to pump up the cutting. These extra strokes would rub off considerable material from the sides of the hole to mix with the next run of cutting; and, if a small band of slate or blackjack were encountered on the next run, the drill operator might conclude that the slate shown on the screen was rubbed off by the rods. In fact, this has happened occasionally, small bands of blackjack being subsequently found in veins reported by the drillers as clean coal.

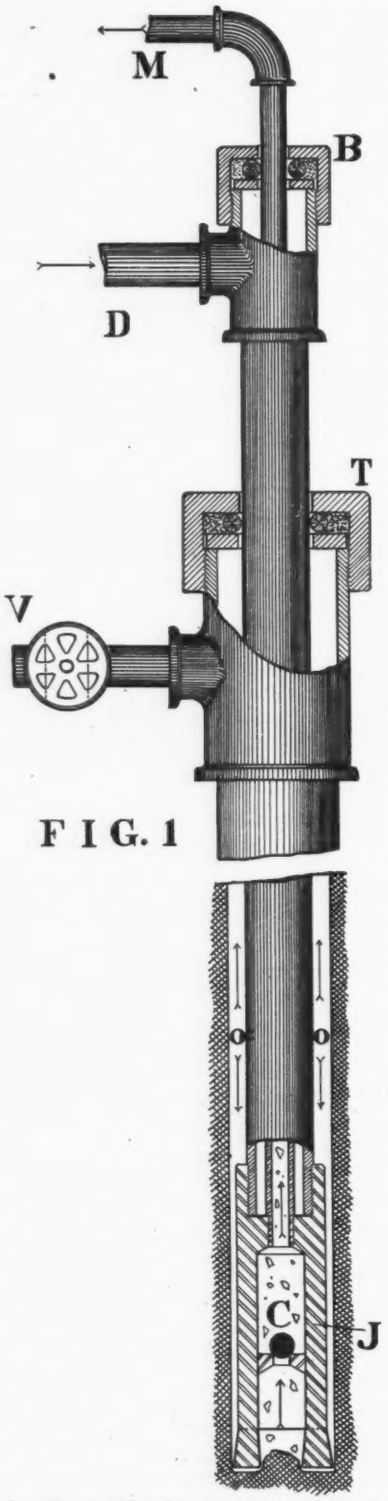


FIG. 1

To guard against these errors, and to get an exact sample of the material passed through, I recently devised an arrangement of rods (shown in Fig. 1). Two drill rods are used, the inner rods being one-quarter inch extra-strong gas pipe, and the outer line of rods one inch extra-strong gas pipe, the internal diameter of the inner rods being 0.29 in., and the outer rods 0.95 in. The drill bit *J* is a hollow cylinder with four cutting edges. Wash-water is pumped down the annular space between the inner and outer rods, entering at *D*, and is discharged through the orifices *O* a few inches above the drill. At this point the current of water splits (a portion, rising around the rods and carrying up the detritus worn off by the rods in the upper strata, is discharged through a tee screwed to the top of the casing, the rate of discharge being regulated by the valve *V*). The balance of the wash-water passes under the drill and carries up the cutting through the inner line of rods. The cutting, emerging at *M*, is conveyed by a hose to the screen box. In case the hole drinks the greater portion of the wash-water, it will be necessary to use a ball in the valve chamber of the drill *C*. In using a ball, care must be taken to force down at least twice as much wash-water as is pumped through the inner rods, in order to maintain a continuous rising current of water around the outer drill rods. By using a hollow cutting-bit, nearly a third of the material drilled through comes up in pieces the size of kernels of corn or larger; and, owing to the small bore of the inner rods, it requires only a few seconds to wash the cutting to the surface. The rods are jumped by an ordinary drilling machine, the tools being connected to the drill rope by a lifting bail under the tee and stuffing-box *B*. It will be found advisable to use the double rods only in the portion of the drill hole where it is important to get an accurate record of the strata, drilling the balance of the hole in the ordinary manner.

In rock such as is usually encountered in the coal measures, and when using single-drill rods, the speed of drilling will vary from 15 to 70 ft. per day; the cost will average from 30c. to 40c. per ft. When using double rods, the progress will be considerably slower, as more time is consumed in raising and lowering the rods to change drills.

In hard rock the gas-pipe churn drill is inefficient, for the reason that the pressure against the drill at the instant of impact is so great, that only the kinetic energy of the lower drill rod is effective. With a string of 400 or 500 ft. of rods, and in drilling hard rock, 95% of the energy of the blow is absorbed by the elasticity of the rods, and the stresses have a ten-

*Mining engineer, Bay City, Mich.

dency to crystallize the metal, particularly where the rods screw into the coupling. In the solid-tool system, the cutting bit is backed by a stem usually 25 ft. long; this constitutes the effective portion of the string of tools.

For drilling deep holes in comparatively hard rock, the method of jumping the drill and stem with a line of wooden poles has been uniformly successful. Of course, the cable commonly used is more convenient in raising and lowering the tools, and in changing bits; but this advantage is offset by the ease and certainty with which broken tools can be recovered with poles.

By using an independent hollow drill and stem with the double line of gas-pipe rods, the jetting and self-pumping churn drills can be made as effective for rock drilling as the solid-tool rig; and they can be used to advantage in prospecting any mineral formation where the rocks are not of admantine hardness—such, for example, as slate, limestone, sandstone, quartzite and schist, often associated with the ores of lead, zinc, iron and copper. The hard, fine-grained, massive rocks (such as granite, diorite and porphyry) cannot be drilled successfully with steel tools, as the bits wear out of gage quickly, thus necessitating a constant reduction of the diameter of the hole.

Figure 2 shows an arrangement of hollow-drill tools for putting down a 4- to 4½-in. test-hole to a depth not exceeding 1,000 ft. through hard rock. The line of drill rods and the arrangement for pumping up the drill cutting are the same as in Fig. 1. A short length of heavy 1¼-in. pipe *Q*, with a steel collar screwed to the lower end, is inserted in the line of drill rods *D*, 23 ft. above the lower end of the line.

The drill stem *G* is a 25-ft. length of 3-in. double-extra-heavy gas pipe, fitted at the top with a hollow-steel pin *G*. A hollow cylindrical cutting bit, with four cutting edges, is screwed to the lower end of the stem.

In drilling, the rods jump the stem *G*, break up the core (left by the main cutting bit), and carry the cutting to the surface. The drill rods are removed from the hole only in case of breakage, the stem and bit being withdrawn from the hole by lowering a hollow socket *W*, attached to a 1⅛-in. water-laid cable by a bridle *R*. When the socket reaches the pin *C*, a spring *S* in the socket engages a groove in the rod *Q*. By rotating the drill rods a few turns, the socket may be screwed on, or unscrewed from the drill stem. With this arrangement very little time is lost in changing drills. As the wash-water keeps the hole clean and prevents cutting and sludge from settling around the drill, the hole need only be cut ¼ in. larger than the drill stem. However, a deep hole should always be started at least an inch larger than the diameter of the drill stem, as hard streaks will be encountered which will often necessitate reducing the size of the hole.

In boring deep holes with any style of drilling tools, vexatious delays will be caused by breakage and unscrewing of the drill tools and rods. As a rule, solid tools are more difficult to recover, and require a greater variety of fishing tools than hollow tools. Using double drill-rods, any break in the rods is instantly detected. Broken rods can be fished with taper taps or with long bell-shaped dies, which slip over a rod or coupling. Three sizes of taps and two sizes of dies will be all the fishing tools required to recover any part of the string of tools in case of breakage. I find it advisable to use left-hand threads and coupling on the inner line of drill rods, as the joints in both lines of rods can be kept tight.

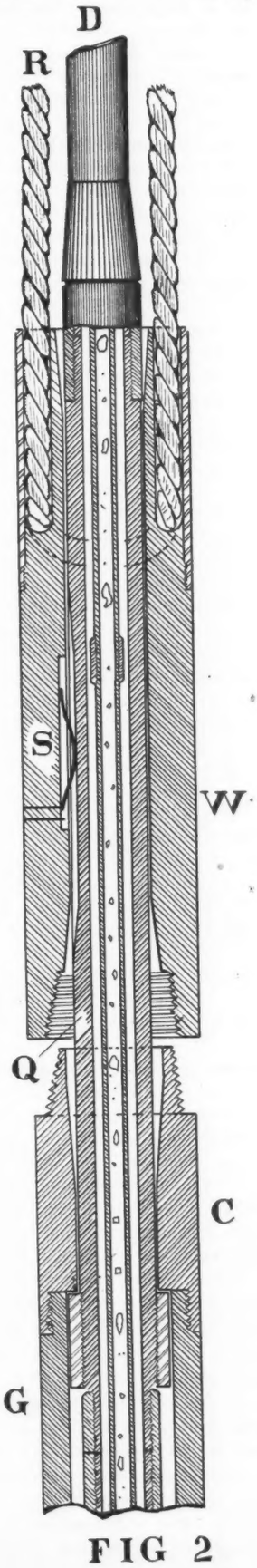


FIG 2

The cost and speed of drilling by this method will compare favorably with the solid-tool and cable-rig system; the samples of material drilled through, and the thickness of the different strata, will be sufficiently accurate for all practical purposes. A complete outfit for putting down 4-in. holes to a depth of 1,000 ft. or less, by this system, will cost $1,200 to $1,500.

Strength of Timber.

Loren E. Hunt, Government engineer in charge of timber testing for the Pacific coast, in a paper read at the Engineering Congress, at Portland, Oregon, June 29 to July 3, 1905, referred to the first systematic effort to test the mechanical properties of timber, by the late J. B. Johnson, at Washington University, St. Louis, in 1891, and continued by giving in detail the present methods in use by the Bureau of Forestry. He presented data showing comparative results, from large timbers of all grades, to small selected specimens, and from red (Douglas) fir to Western hemlock. The large timber was found to develop a modulus of rupture of from 50 to 90% of that shown by the small specimens, depending upon the dimensions and conditions of specimens. Western hemlock was found to develop somewhat over 80% as much strength and elasticity as the red fir. In the discussion, results were given of some recent tests of Alaska spruce, made at the University of Washington, Seattle, in which the results, from 7 by 8-in. specimens, cut from small trees and full of knots, were less (though not to any great extent) than those obtained from Western hemlock and the poorer qualities of fir.

The use of milk of lime as a quick and effective extinguisher in mine fires, and especially in coal mines, is discussed with approval by Inspector Wolfgang Kummer in *Oest. Zeit. für Berg- und Hüttenwesen.* The suggestion is not new, but the author gives several instances of its success, and answers the fallacious arguments against it. The emulsion can be used either with large or hand pumps. One of the advantages is that the lime runs into and fills the crevices of the coal or mineral.

Pyrite Mining in Virginia.

BY R. H. PAINTER.

Pyrite carrying more or less copper is found along a comparatively narrow belt, extending from a point about 30 miles south of Washington, thence about S. 30° W. throughout the middle and south-Atlantic States; the deposits of economic importance have been largely developed and worked in the State of Virginia only. The mines of note are near Mineral, Louisa county, and Dumfries, Prince William county.

The deposits consist of a series of lens-shaped bodies lying nearly conformable with the enclosing country-rock of slate and schist. This slate, in Stafford and Prince William counties, has been named 'quantico' and marks the fall-line between the Piedmont plateau and the Coastal plain. The lenses, where outcropping in size, are capped by gossan which at one time was a source of iron ore, as in the Louisa mines. The lenses are of varying size; in the Louisa mines, lenses several hundred feet long and, at points, as thick as 80 ft., have been worked; in the Cabin Branch mine, near Dumfries, 10 ft. may be taken as the maximum thickness, although one lens has attained a length and breadth of nearly 1,000 feet.

The ore is sold, on a basis of the sulphur content, at a variable price per unit, and is prepared for market in three sizes, lump, spall and fine. Lump is the first-class ore as broken in the mine, but free from adhering slate or lean material. Spall is clean lump broken to burner size (passing a 2½-in. ring) from which the fine and smaller size, produced by breaking, have been screened. Fine is ore which will pass a screen having an aperture of about ⅜ in. It is usually washed or jigged to bring it up to shipping grade.

Cement copper is obtained from the mine water by precipitation upon scrap iron, and is dried, screened and barreled for market.

As the orebodies dip from 70° to 15° to the east or west, the general practice is to develop them by inclined shafts sunk in the orebody. In the Louisa county mines, stopes are opened up by driving levels along the lens at economic intervals, which are then connected by raises and the ore broken down by overhand stoping. As the walls are comparatively strong, little timber is used and the levels are protected by massive pillars with small openings into the stopes through which the ore is drawn to be loaded into mine cars. Some timber and filling has been used in the upper levels, and the surface has, in some instances, caved into the old open-cuts. The mine water is quite acid, but is small in volume. Haulage is by mules. The mine cars are dumped into the skips. Machine drills are used largely, and little sorting is done underground. Day-labor is the rule, though occasional contracts are let upon development work. Ventilation is natural, aided by board partitions.

In the Cabin Branch mine, the conditions have caused somewhat different methods to be adopted. The walls are very soft, the ore often much faulted, and the dip variable. The mine is opened by an inclined shaft following the ore in a general way, but often cutting into the slate to some extent to avoid the sharper bends which the orebody makes. There is a second (vertical) shaft at one end of the mine, which is used both for a manway and for ventilation.

Levels are run off at intervals, varying from 40 to 90 ft., according to the dip. The driving of these to the extreme end of the lens is pushed as fast as possible, an occasional raise being made for ventilation, which is widened out into a flask-shaped stope as drifting proceeds. As the stopes are lengthened, 'breakthroughs' are made into the levels, every 30 ft., from which the mine cars are loaded. When the dip is steep enough to allow the ore to slide, chutes are employed. As the ore is extracted, the roof is held by round pine props or stulls. A thin rib of ore is left at the top of a stope to carry the track above, until that level is stoped out. Draw slate is packed away in the middle of the stope, and held by cribs when necessary. When a level has been thus stoped out, robbing of ribs and stumps begins at the outer end, retreating toward the shaft. When the props hold up the back over too great an area, they are shot out to keep the ground caved nearly even with the retreating party. By this method, little ore, except that shot into the slate packs, is lost in mining. As much slate as possible is picked out and left in the stopes. Machine drills of 2½-in. size are used for development; and stoping, where the ore is thick enough. Where the ore is thin and in robbing, hand drills are used to better advantage. Some 2-in. drills, run by one man, are used in stoping with fair success.

Sinking is carried on during each day shift; the sump and levels in slate being mucked at night. When a fault occurs, a level may be in slate for some distance before regaining the ore; and, as the next level below is usually but little stoped at this time, the slate muck has to be hoisted; but, when possible, it is dumped into old stopes for refilling. The mine has 10 levels. Skip signals are blown by reducing spring-valve connections to the main air-line, and sound both in the mine and in the engine-room. The shaft is timbered with 4-piece sets of round 12-in. spruce, spaced 6-ft. centers, and lagged with 5-in. poles. As the dip is seldom over 40°, no level pockets are provided, but the mine wagons dump direct into the skip, which is of 3,000-lb. capacity. Tramming is by hand and day-labor is generally employed, a premium being paid for excess footage driven in development work.

The larger part of the output of the Louisa mines consists of fine. One mine turns all its ore into fine. At this mine, the skip dumps upon a grizzly of railroad iron set 3 in. apart. The slate is picked and forked from the two sizes, which go to their respective crushers at the head of the mill. By successive crushing with breakers and rolls, and screening by trommels, the ore is here reduced to jig size and fed by a distributor to the Hartz jigs. Jigging through a bed of cast-iron balls is employed, and the hutches discharge upon a belt-conveyor of ascending grade, which delivers to the stock piles, where the ore soon drains.

At another mill, the skip dumps upon a similar grizzly; the oversize is sorted into No. 1 lump for shipment, No. 2 lump to the mill, slate to waste; the undersize falls upon a floor, where it is forked and the slate picked out, the remainder going to the mill in a separate car by rope haulage. Some of the lump, generally the better grade, goes to a jaw-breaker set to make spall ore, a fine-bar grizzly cutting out that under 1¼-in. size, which goes to the mill. The spall ore is loaded in box cars, after being inspected and having the slate thrown out. The mill is arranged to crush the ore by successive steps, in Blake crushers, roll-jaw crushers and rolls, with repeated screening, to jig size. The same practice (of jigging through a bed of cast-iron balls) is employed; but the jigs discharge into a de-watering device which feeds a belt-conveyor delivering to the stock pile, bins or a hearth drier, depending upon the weather. Tables are being installed to treat the overflow from the de-watering tank.

At the Cabin Branch mine, the skip dumps upon a 2½-in. grizzly. The oversize goes to the lump-ore storage-bin, from which it is drawn off at intervals and sorted. Slate goes to the dump, first-class lump to the spalling floor and the remainder to a roll-jaw crusher at the head of the fine-jigging annex. The No. 1 lump is all spalled by hand (to avoid excess production of fine) to burner size, and forked into measuring chutes delivering to the cars. This spalling is done by contract, the men using long-handled hammers of 2-lb. weight, and working upon a thin layer of ore upon the floor at one time. The resulting fine is small in amount and is screened into the fine bin. The undersize from the grizzly goes to a revolving screen with 1¼-in. round holes, through which the ore is washed into the pebble-ore jig. The oversize goes to a slate-picking chute delivering upon the spalling floor. The pebble-ore jig is a three-compartment Hartz jig fitted with No. 2 mesh, No. 8 iron-wire screens. It discharges, from the spouts, clean pebble and middling; from the hutch, clean fine, middling and waste. It handles up to 75 tons per day at 150 r.p.m. The clean

pebble is elevated to a screen delivering to a shipping chute, the small ore being returned to the roughing rolls. The clean fine runs into the fine bin which is heated by exhaust steam. The fine middling is elevated to the roughing rolls. The crushed ore, after passing through rough rolls, meets the No. 2 lump which has passed the roll-jaw breaker, and the product from the fine-crushing centrifugal rolls, and is elevated to a two-unit centripact screen. The upper screen is 2⅜-in. aperture, and the oversize goes to the roughing rolls; the second screen is ⅛ in., and the oversize goes to the fine rolls; the through size goes to the fine jigs (which are of two compartments), jig through a bed of iron balls, and discharge into the fine bin. The installation of spiral slate-pickers (to rough-pick the 1½-in. pebble-ore) is being considered.

All the chutes and bins discharge direct into 10-ton narrow-gage cars, in which the ore is hauled over the road of the company to the shipping points on the Potomac and the Washington Southern Railroad, six miles distant from the mine.

Mercury in Tuscany.

According to British Foreign Office Report, No. 633, Misc. Series, the output of mercury in Tuscany in 1904 amounted to 355 metric tons, valued at about £80,000, and the indications are that it is likely to increase. The most important mine is Siele, near Castell, Azzara. Other mines have recently been opened at Badia, San Salvadore, and at Montebruno. The mine at Cortevecchia continues to produce regularly. On a belt of land, starting at Monte Amiata and extending southward to Capita, there are found at intervals indications of mercury.

One of the principal difficulties in the operation of the ordinary type of suction producer is the maintenance of a sufficiently uniform quality of gas to insure the correct explosive mixture at the engine cylinder. This is especially the case where the load is at all variable, and is often so serious that many makers will not recommend the use of suction producers, unless the load to be carried is fairly steady. The chief cause of this variation in the quality of the gas is that the percentage of steam carried by the blast is not constant, the percentage of hydrogen in the gas varying accordingly.

The method of obtaining alumina and alkali from such rich silicates as leucite, according to the Levi process, is designed to extract the mineral with a hot alkaline or alkaline-earth solution from which the alkali and alumina are subsequently recovered (British patent 13,875).

The synthesis of water, by the influence of radium emanation, has been recently accomplished.

Ore Deposits of the Sierra De Los Caballos.

BY CHARLES R. KEYES.*

The Sierra de los Caballos is a formidable block mountain in south central New Mexico. This range is about 30 miles long, and is washed by the Rio Grande on the west. It rises abruptly to an elevation of over 4,000 ft., or about 8,000 ft. above sea-level.

For many years copper has been mined on the west side of the range, but owing to inadequate transportation facilities the development has not been what it would be under more favorable conditions. The ore has to be packed on burros over the range and then hauled in wagons 20 miles to railroad.

During the last two years gold has been exploited more or less extensively, principally at the mouth of Apache cañon. A rather full account of this new placer field was given in this JOURNAL (December 24, 1903, page 966).

Within the year another camp has been opened which is more promising than any of the others. This is on the east side of the mountains, under the highest point (Timber Peak). The deposits are lead ores; there are in the vicinity also gold and copper prospects. Lime and iron abound in the neighborhood, and plenty of good coking coal; so there are good conditions for an independent smelting enterprise, the main line of the Santa Fé railroad being only 12 miles away. The new lead camp thus promises to be prosperous from the start.

The Sierra de los Caballos and the Sierra Fra Cristobal, to the north, form the rugged western boundary of the vast level area known as the *Jornada del Muerto*, or the Journey of Death, a name given by the early Spanish explorers. The west side of the range forms a sheer precipice of nearly 2,000 ft., which rises above the steep talus leading up from the Rio Grande to an elevation of 1,500 to 2,000 ft. from its base. On the east side of the range the general slope is that of a stratum-plane inclined about 20°, away from the mountain.

The eastern slope of the range is rough, owing to the rapid corrasion of the drainage-ways which reach the Rio Grande, 800 to 1,000 ft. below the general level of the plain. The gradient of these arroyos is over 100 ft. in the mile. A strip of country, four miles wide on the average and 20 miles long, on the east flank of the range, drains into the Rio Grande through Las Palomas gap, a deep box-cañon that cuts the range in two. This belt of country is faulted in many places. It is traversed by basic dikes and is altogether a rough bit of country, though easily accessible by wagon. The cañons are

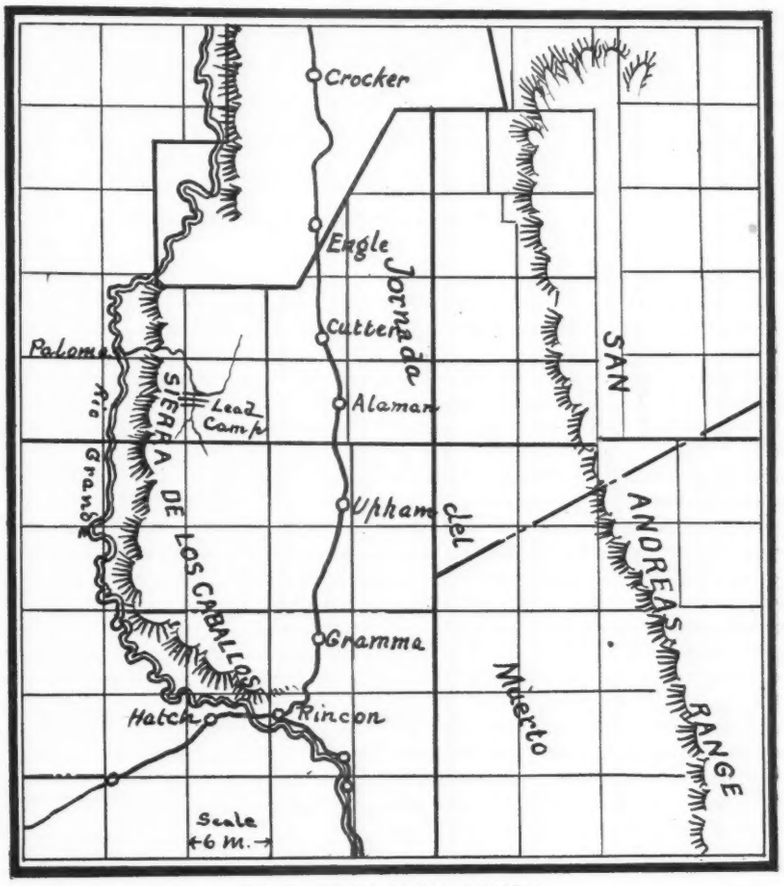


FIG. I. SIERRA DE LOS CABALLOS.

*President New Mexico State School of Mines, Socorro, N. M.

numerous and labyrinthine. Mescal cañon and Palomas cañon are the master drainage-ways into which all others empty before their waters cross the mountain axis and fall into the Rio Grande.

All the tops of the hills in this rough strip are nearly on a level, which is the same as that of the general surface of the Jornada plain projected westward from its middle line. Consequently, when viewed from the railway train at a distance of a dozen miles, the surface of the plain appears to be unbroken to the very foot of the mountains, and to merge with its talus-slope that reaches down from the more precipitous portions.

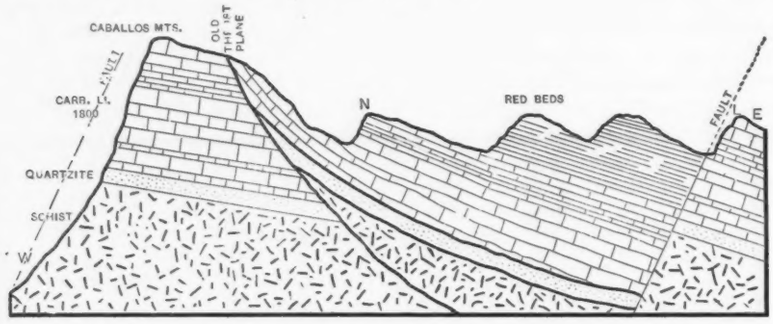


FIG. 2. GEOLOGICAL SECTION IN LOS CABALLOS.

The main drainage-way (in the valley of which the new lead camp is situated) runs northward at the foot of a broad incline plain, on which the main vein outcrops are situated. It drains a tract of country to the south of some 20 sq. miles, most of which is rather gentle mountain slope. At a point about a mile north of the camp the arroyo turns abruptly to the west, passes through a deep cleft in the Caballos range (called Las Palomas Gap) and reaches the Rio Grande. There is a deep valley between the crest of the incline plain and the main ridge of the Caballos, which opens into the arroyo just mentioned a short distance from the point where the latter passes into the box-cañon portion of its course. The general geological section of the Caballos mountains is given herewith:

	Feet.
5. Sandstone, yellow, and coal-bearing shale of Cretaceous age (exposed to the eastward, but entirely eroded from the mountains)	2,000
4. Shale and sandstone, bright red in color, the 'Red Beds' (of Triassic and Carboniferous age), well exposed at the east foot of the range.	800
3. Limestones, blue, white and dark-colored, in different layers, fossiliferous, Carboniferous in age (exposed in the mountain face)	1,500
2. Quartzite, probably of Caroniferous age	100
1. Schist (biotitic), gneiss (crumbled), and red granites, probably of Proterozoic age (exposed)	1,000

The country rock, which the ore-veins cut on the stratum surface, is a dark blue, rather brittle, compact limestone, which is the surface rock of all the eastern slope of the Caballos mountains. The stratum-plane on which the veins are best exposed is the uppermost layer of the limestone formation. From this surface the 'Red Beds,' which once covered the limestones to the top of the range, have been entirely removed through erosion down to the foot of the mountain, where they abruptly rise several hundred feet above the bed of the arroyo.

The geological age of the limestone is for the most part late Carboniferous. It is possible, however, that 100 or 200 ft. of the lowermost beds will eventually prove to be early Carboniferous, as has been fully demonstrated in neighboring ranges.

The relationship of the several geological formations, and the character of the faulting connected with the uprising of the mountain block, are shown in cross-section in the accompanying diagram.

The line of the section is along one of the main veins, the trend of which is nearly at right angles to the axis of the range. The thrust-plane shows a vertical displacement of at least 1,200 ft. No orebodies are connected with it. Its formation antedates very much the formation of any of the orebodies of the district. The main fault on the west side of the mountain-block has a throw of more than 4,000 ft.; and there is evidence of additional faulting to the westward, making the total displacement very much greater.

From the mountain top the dip of the beds is to the eastward at a rapid rate. The beds, however, soon seem to flatten out and then to rise again 30 miles to the eastward to the crest of the San Andreas range. While the general arrangement of the beds between the two ranges mentioned is that of a broad synclinal trough, the local dips are much greater than the surface of the plain, which is thus worn out on the beveled edges of all underlying indurated strata.

The section (shown in Fig. 3) gives the structure in the neighborhood of the lead camp, as viewed at right angles to the trend of the ore-veins. The orebodies occupy the lines of faulting, both in the cases mentioned and in others in the neighborhood. The displacement in the Nancy fault (A) is about 100 ft. At the Napoleon fault (B) the drop is about 40 ft. On the Rosa Lee fault (C) the throw is somewhat less, and is not as yet accurately determined.

The ores are contained in what appear to be true 'fissure veins,' which have been formed along fault planes; without doubt they extend to a great depth. Most of the veins consist of extensive plates of ore, which are remarkably uniform in thickness and of nearly vertical position. The general trend of the veins is east and west, or nearly at right angles to the axis of the mountain range.

The surface exposure of the veins on the east side of the range is along the upper stratum-plane of the limestone. On the west side of the range the exposures of the visible veins are normal to the stratum-plane or along the broken edges of the rockbeds. The stratigraphical position of the vein-outcrops on the east side of the range is, therefore, at the top of the limestone, here 1,500 ft. thick. The position of the outcroppings of the veins on the west side of the range is at, and below, the bottom of the limestone.

The vertical distribution of the ore is of unusual interest. The ore at the top of the limestone on the east side of the range is a galena carrying a small amount of silver. At the bottom of the limestone, 1,500 ft. beneath, and in the underlying quartzite, the ore is chiefly chalcopyrite and bornite, with practically no malachite or azurite. The copper ores have their best development in the quartzite, though they extend upward into the limestone and downward into the old crystalline basement composed of gneiss, schist and ancient intruded granite. Below the quartzite, the veins appear to become gold bearing. It is thought that the rich gold placers which are found along the west side of the range have been derived largely from this zone.

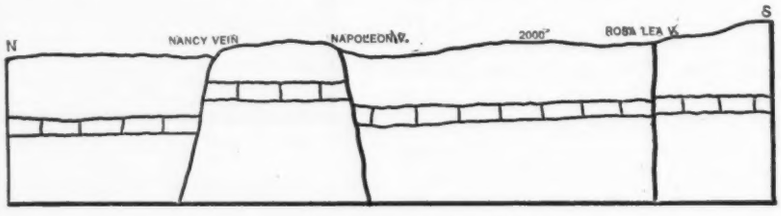


FIG. 3. FAULTING IN LOS CABALLOS.

The gangue of the orebodies consists chiefly of barite, fluorite and quartz. At a depth of 300 ft. from the surface of the limestone, copper begins to appear associated with the lead. The surface alteration extends to a depth of only a few feet. In this surface zone fine wulfenite crystals occur.

The largest vein is exposed, unbroken on the surface, for a distance of 2,000 ft.

It no doubt extends farther in an eastward direction, but is covered by gravel and sand of the arroyo and the 'Red Beds.' At its widest point it measures 22 ft., and nowhere is it observed less than 4 ft. The vertically exposed depth of the vein is probably over 300 ft. An adjoining vein is 8 ft. in width at the points where two shafts have been sunk. Other veins are 3 to 4 ft. in width. Judging from the geologic conditions, it is reasonable to expect that the fault-planes, on which these veins are opened, extend entirely through the limestone formation into the ancient crystalline basement beneath.

The principal properties are now being developed by the Southwestern Lead & Coal Company under the general management of Max. B. Fitch. A complete electric plant is being erected on the coal property, and all the power for the mill will be conducted by wire a distance of four miles. The concentrating plant will have a capacity at first of 50 tons per day.

The Collie Coalfield.

An important report has been made upon the position and prospects of this field, of West Australia, by Dr. R. Logan Jack, the Royal Commissioner. This field comprises about 50 square miles in area, and lies south of Perth.

The coal-bearing strata are not the equivalent of the Newcastle beds of New South Wales, but are of considerably later age—a point of some importance in view of the fact that it is with New South Wales coal that the Collie coal has chiefly to compete. There are estimated to be over 300 millions of tons of workable coal in the field, often in thick seams, the thickest of which, the Wallsend seam, sometimes reaches 17 ft. Only about 6 to 9 ft. of these thick seams can be profitably extracted, and, owing to the friable nature of the coal, about 60% has to be left for support, and the proportion of small coal is excessive.

Mining is carried on by adits from the outcrop, involving a large amount of underground haulage. The coals are semi-bituminous and non-caking. They do not store well, even briquettes being found to be liable to spontaneous combustion. Compared with New South Wales coal, the Collie coals are distinctly inferior for steam-raising purposes. It takes 1⅓ tons of Collie coal to do the work of one ton of New South Wales coal.

The new Chilean railway line from Arica to La Paz will be connected with the important mining center of Oruro, at present only to be reached from the sea coast by the line from Antofagasta, a distance of 560 miles. The new route from Arica will be about 280 miles.

A steel containing 4.99% vanadium and 1.084% carbon, failed at 140,596 lb. per sq. inch.

Standard Screens for Screen Analysis.

BY COURTENAY DE KALB.*

The movement of the Institution of Mining and Metallurgy in the direction of standardization of screens is welcome; the necessity for uniform standards is appreciated by those who realize the importance of a sure basis for the interchange of professional experience. Engineers are, of course, familiar with the efforts of Rittinger, Richards, Waggoner and others, to develop a scientific and practicable series of screens for the analysis of crushed ore. The great difficulty of the problem is that of economical manufacture, although it must be confessed there is a disparity of view among engineers as to what conditions the curve representing successive diameters of opening should fulfil.

The chief objection to the logarithmic plot is that it does not convey any immediately intelligible impression to the mind of the majority of men who are engaged in the treatment of ores, while any intelligent man can appreciate the significance of the law expressed by a straight line, and any divergence from that law (as shown by the plot of his results) conveys at once to his understanding not only the fact of error, but also the measure of it. Therefore, I favor the adoption of a series of screens whose successive apertures shall increase by arithmetic progression.

The suggested table of standard screens, issued by the committee on standardization of the Institution of Mining and Metallurgy, possesses the unfortunate difficulty of not conforming to either arithmetic or geometric progression. The curve (plotted from the committee's table) is shown by the line *A C*, Fig. 1, including meshes 30 to 8. I suggest that the efforts of the committee would be worthily employed in the investigation of a possible series conforming to an arithmetic progression, or, at any rate, to some curve whose law can be expressed by an equation.

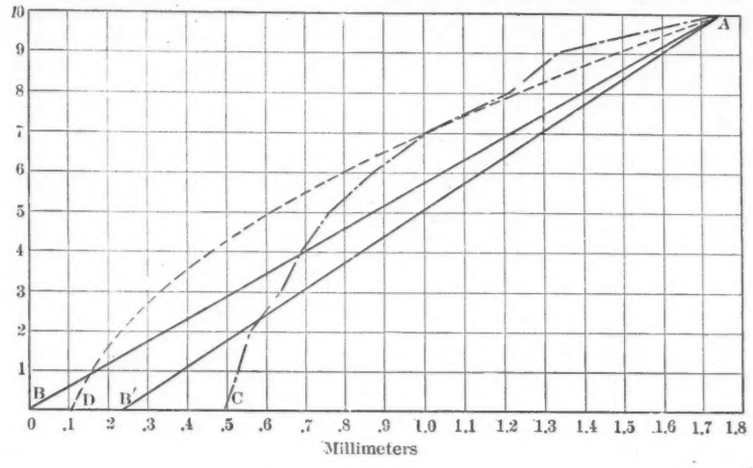


FIG. 1.

The committee has evidently felt the limitations of the standard screens, previously suggested, in respect to the small number of sieves in the series; this is characteristic of those schemes which depend upon geometric progression. There is no question that, the smaller the difference between successive quantities of pulp, the more exact will the analysis be. On the other hand, anyone who has done much of this sort of work will realize the enormous amount of labor required if the number of sieves in the series is too great, and it seems to me that the number suggested by the committee is excessive.

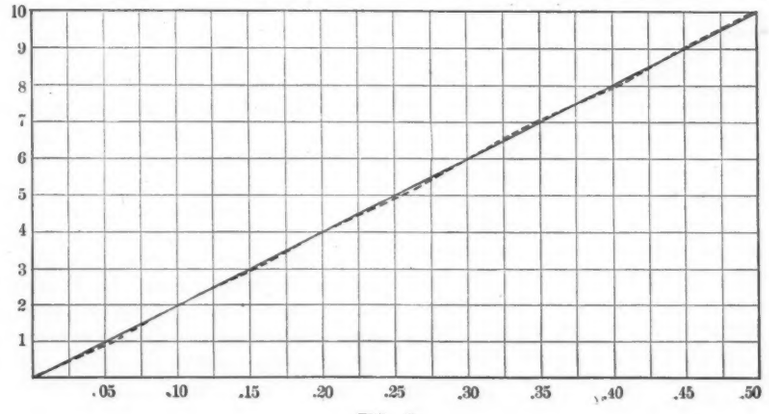


FIG. 2.

*Consulting engineer, Exposed Treasure Mining Co., Mohave, Cal.

It is possible to construct a series with successive diameters of opening increasing by arithmetic progression and using the present standard sizes of brass wire, the only peculiarity being the oddness in the number of wires to the linear inch. The difficulty in making these odd sizes is that manufacturers cannot afford to reset their looms for a small quantity of wire cloth; but, if a certain set of screens were declared *standard* (by uniform action of the mining institutes of America and Great Britain) the manufacturers would probably manufacture special wire, at no excessive cost. Table No. 2 shows a series from 154 mesh to 28½ mesh. The plot of this progression is shown by the dotted line in Fig. 2, the straight line representing the ideal aimed at. This series, of course, can be increased to any desired size, using the formula

$$M = \frac{1}{O + G}$$

M = the number of mesh sought.
O = diameter of opening desired.
G = the diameter of the wire of which the screen is to be made.

I have never had this set of screens manufactured, but the W. S. Tylor Company, at my request, and at insignificant cost, made a set of screens several years ago, copies of which are now in use at a number of mines in this country and in Mexico; the details of these are given in Table No. 1. For the successive diameters of opening in this set the equation is

$$L = A + (N - 1)\,D + (N - 2)\,D + [N - (N - 1)]\,D.$$

L = last term of the series.
A = first or last term of the series.
N = number of terms.
D = the common difference between successive differences between the successive diameters of openings, which in this case is the fraction 0.0254 mm.

Claude E. Jamison has called my attention to the fact that the last term in this series is also represented by the equation:

$$L = C + \frac{N - 1}{2}\,N\,D.$$

L = last term of the series.
N = number of terms in the series.
D = the constant difference between successive differences between the successive diameters of openings.
C = a constant = the diameter of the first or smallest term in the series bearing the relation of 3 D, which in this case is 0.0762 mm.

As will be seen, there is a regular progression, which is based upon an arithmetic progression of successive differences between the differences in diameters of openings in successive screens. The line *A D*, Fig. 1, shows the plot of this curve from the second to the twelfth term. While not a straight line, and therefore not fulfilling the ideal condition according to my view, it does give a curve which is sufficiently near to a straight line to admit of detection of vagaries in the screen analysis, and it has the merit of obeying a definite law; further, it is sufficiently expanded as to the number of screens within relatively small limits, there being 21 between the sizes 0.0762 mm. and 5.4102 mm. This set of screens has the further merit of being obtainable without any extra cost of manufacture.

The question of direct plotting of quantities remaining upon successive screens, or making the well-known cumulative plot, seems to me to be a matter of individual preference. I generally plot both on the same sheet, and frequently find my pains repaid by some further illumination which this relation throws upon the investigation. All statements of sizes can be in inches; but for convenience the metric system is almost certain to be employed. This, furthermore, will admit of expressing the screen in any terms of mesh, or in any terms of size of opening, in a manner which will be readily comprehensible by all. The mere fact of relative size will convey a distinct impression; and, as between 0.05 mm. and 0.45 mm., there will be a much more ready intellectual discrimination than between 33½ mesh and 154 mesh, or any other meshes that could be adopted, unless the series were made to have a uniform difference in aperture, corresponding to a regular progression in the meshes; to accomplish this it would be essential to manufacture wires from special dies in accordance with a metric gauge.

TABLE No. 1

Mesh No.	Diameter of Screen Openings. Mm.	In.	Differences Between Successive Diameters of Screen Openings. Mm.	In.	Decimal Gauge of Wire. In.
3½	5.4102	.213	.....	.....	.072
4	4.9022	.193	0.5080	.020	.057
4½	4.4196	.174	.4826	.019	.0482
5	3.9624	.156	.4572	.018	.044
5½	3.5306	.139	.4318	.017	.043
6½	3.1242	.123	.4064	.016	.031
7	2.7432	.108	.3810	.015	.035
8	2.3876	.094	.3556	.014	.031
9	2.0574	.081	.3302	.013	.030
11	1.7526	.069	.3048	.012	.022
12	1.4732	.058	.2794	.011	.025
14	1.2192	.048	.2540	.010	.023
18	0.9906	.039	.2286	.009	.016
22	.7874	.031	.2032	.008	.014
28	.6096	.024	.1778	.007	.0113
34	.4572	.018	.1524	.006	.011
50	.3302	.013	.1270	.005	.007
70	.2286	.009	.1016	.004	.0053
90	.1524	.006	.0762	.003	.0051
120	.1016	.004	.0508	.002	.0045
150	.0762	.003	.0254	.001	.003667

TABLE No. 2

Mesh No.	Diameter of Screen Openings. Theor. Diam. Mm.	Theor. Diam. In.	Actual Diam. Mm.	Actual Diam. In	Old English Wire Gauge. No. of Gauge	Diam. of Wire In.
28½	.5	.019685	.4975	.019587	29	.0155
33½	.45	.0177165	.4470	.0176007	31	.01225
37	.4	.015748	.4007	.015777	32	.01125
40	.35	.0137795	.3492	.001375	32	.01125
45½	.3	.011811	.2979	.011728	34	.01025
53	.25	.0098425	.2506	.009868	35	.009
65	.2	.007874	.2002	.0078846	36	.0075
80½	.15	.0059055	.1504	.0059223	37	.0065
112	.1	.003937	.0997	.003928	39	.005
154	.05	.0019685	.0506	.0019935	40	.0045

The Hancock jig is being used in the works of the Penn-Wyoming Copper Company, at Encampment, Wyoming. This was one of the first installations of this jig in the United States.

Good pit or cake copper has large surface 'wrinkles.'

A Portable Assay Furnace.*

BY J. J. GILLIO.

An assay furnace that is easily portable is indeed a desideratum. The gasolene furnace practically fulfils the needs; but it has the drawback of being dependent on gasolene, which is seldom obtainable locally, and has to be ordered a long time beforehand. It occurred to me that if it were possible to substitute kerosene (which is easily procured everywhere and at low cost) the furnace and appurtances could be modified sufficiently to suit the new fuel. On an actual trial under normal working conditions, it was found that, with trifling alterations, the ordinary gasolene burner would give satisfactory results with 150° fire-test kerosene. Accordingly a trial extending over several months of fairly frequent work, and under all sorts of conditions, was entered upon.

The ordinary gasolene furnace consists of a reservoir, in which the gasolene is poured through a hole, afterward made air-tight with a screw-plug and leather washer. To the reservoir, an air-pump (much the same as a bicycle pump) is attached, connected through a check-valve to a pipe leading inside the reservoir; this delivers air (pumped in above the surface of the gasolene), creates a pressure in the vessel, and forces the liquid along the outlet pipe leading from the bottom of the vessel to the burner. The burner or vaporizer consists essentially of a pipe bent on itself in such a way that the vaporized liquid issuing from the outlet partly impings on the pipe itself; thus part of the heat produced goes to vaporize a further supply of gasolene. At the start an initial amount of heat (sufficient to vaporize a little of the gasolene) has to be supplied from some outside source, and this is generally provided by burning a little gasolene in an open vessel under the burner. The amount of gasolene burned (and thus the amount of heat generated) is regulated by a needle valve closing the orifice from which the vapor is issuing. The jet of vapor, issuing with considerable velocity, is made to draw in a quantity of air, on the same principle as a Bunsen burner, and thus perfect combustion is insured.

The burner (as manufactured in America under the Hoskins patent) consists of a single casting of brass in which holes are bored in straight lines intersecting each other, so as to form a continuous passage for the gasolene or other liquid; the holes on the outside of the points of intersection are stoppered by screw-plugs of brass, thus giving opportunity for an occasional cleaning. The liquid fuel enters at the lower end, where it joins with the supply pipe from the reservoir, thence horizontally to the front end of the burner, which, exposed to the radiating heat from the furnace when in operation, becomes red hot, and thus converts the

*Abstract of a paper in *Trans.* Austral. Inst. Min. Eng., 1905, Vol. X.

liquid into a gaseous fuel. From the front, the vapor travels another passage at the top of the burner to the back of the burner again, thence downward to the valve chamber, from which it issues in a horizontal jet through a wide passage having free communication with the air (with which it is mixed in the necessary proportions), and, on leaving the burner, it enters the furnace orifice as an intensely hot pale-blue flame. In the lower duct of the burner several lengths of copper wire are introduced and left loose, presumably to conduct some of the heat from the hot to the cold part of the burner.

In substituting kerosene as a fuel, the wires are taken out, as, owing to the temperature of the front of the burner, kerosene deposits carbon in the passages through which it travels, and the wires in question help to choke them; this is the greatest fault to be found in the use of kerosene. However, it does not amount to a great deal, and to overcome this defect it is sufficient to take the screw-plugs out and clean the inside of the passages by inserting a small wire brush (or a bent and flattened wire), finishing the cleaning by pouring a little kerosene through the passages to wash out the last traces of sediment. The whole operation will not take more than ten minutes, and should be done before heating the furnace.

The form of furnace found the most satisfactory for use with kerosene consists simply of a nail-can 12 in. in diameter and 16 in. in height, lined with fire-clay. This will take four H crucibles. The fire-clay at the sides is uniformly ½ in. from the sides of the crucibles.

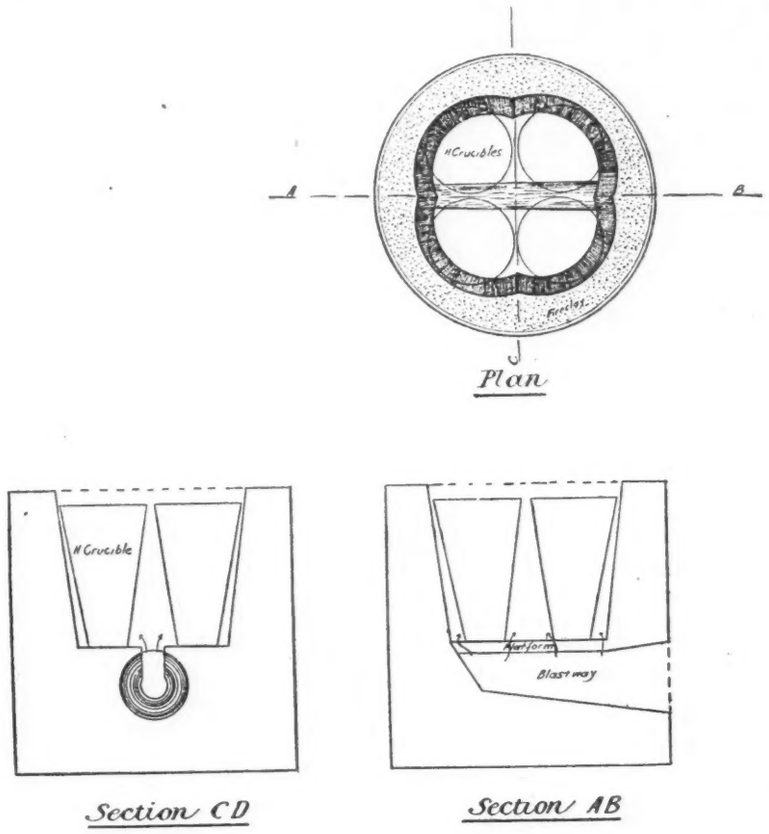
In the side of the can, near the bottom and below the platform upon which the crucibles rest, is a hole about 4 in. in diameter at the opening, and extending nearly across the furnace. A slit in the upper part of the hole (1 in. wide and running the full length of it) provides communication between this hole and the crucible chamber.

A fire-clay tile of shape suitable for a cover to the can also diverts radiated heat to the parts of the crucible that the flame does not touch directly.

The heat generated with kerosene is all that can be desired, and I have never had any trouble in obtaining a satisfactory fusion with all sorts of charges. The hottest zone in the furnace is the farthest away from the burner, so that the two more remote crucibles will run down first. In practice, starting with four crucibles in the furnace, the two farthest from the burner are poured when ready, shifting the two nearest ones to the place occupied by the two just poured, and then putting two fresh ones on the places rendered vacant. Thus the crucibles are first put in a comparatively cool place, where the charge will quietly run down; then they are shifted to a hotter place till ready to pour. Owing to the gradual application of the heat there is little risk of a crucible cracking. I have, on several occasions, run down small bars of gold, the heat being sufficient to give a satisfactory melt in a few minutes. The muffle furnace does not differ essentially in construction from the melting furnace. The flame is made to travel along the bottom of the muffle, where it splits in two and goes around each side of the muffle, uniting at the top; the heat generated is more than sufficient to do any ordinary muffle work that an assayer is likely to have.

The makers and users of gasolene furnaces recommend to connect the muffle furnace with a chimney to create a draught for oxidizing purposes; the recommendation has not been found satisfactory. In spite of the draught, reducing gases from the combustion of the kerosene appear to be injected into the muffle through the slit at the back, and in consequence cupelling became slow. The lead in the cupels is often quite hot—hotter, in fact, than is necessary or advisable—and yet its surface keeps still and perfectly bright; but as soon as air is forced into the muffle with a small bellows, or even by blowing toward the mouth of the muffle through a bit of glass tubing, ozidation proceeds rapidly. The conclusion was inferred that communication must be cut off altogether between the muffle and the heating part of the furnace, and an independent draught must be created through the muffle. The slits in the muffle were stopped with fire-clay and a hole was bored in the top of the muffle at the back, about 1¼ in. in diameter; in this hole rests the end of a pipe (a piece of common 1-in. iron steam-pipe) about 6 ft. long, leading upward and through the roof of the building, to which it is secured, so as not to put any weight on the muffle itself. The plan answers perfectly; the draught is found to be ample—in fact, it had to be moderated somewhat—and it does not affect the heating efficiency of the apparatus in the slightest degree. Another consideration that led to the adoption of the pipe communicating from the interior of the muffle to the exterior of the assay building, is the necessity of getting rid of the lead fume produced in cupellation; not a trace of it was ever perceptible after the pipe was installed.

The melting furnace weighs only about 50 lb. complete, the muffle a little less, while the reservoir and burner add only 8 lb. to the weight. The furnace can be started at a minute's notice, and will reach a smelting heat in 30 to 45 minutes.



Portable Assay Furnace

Scale 2 - 1

The Disseminated Copper Ore of Bingham, Utah.

Bingham, Utah, has become one of the important copper-producing districts of the United States. Its ores occur in two forms, namely, in large masses in metamorphosed limestone and in grains disseminated through monzonitic intrusives. The orebodies of the former class occur in the form of lenticular beds lying roughly parallel with the stratification of the country rock. These beds are localized into elongated lenticular shoots, which dip roughly with the bedding and pitch moderately. These shoots are sometimes of great size, being several hundred feet in length along their strike, nearly 200 ft. thick, and have been followed downward continuously for several hundred feet. The ore is essentially pyrite, containing from 2 to 4.5% copper, 2 to 5 oz. silver and 10c. to $1 gold. Associated with the copper deposits there are bodies of silver-bearing galena, containing more or less zinc blende.

The disseminated copper ore occurs throughout extensive stocks of monzonite, but particularly in areas where it is fractured, fissured and altered. In such zones there are found irregular grains of copper-bearing pyrite in small veinlets, chiefly along joint or fracture planes. Definite shoots of this mineralization have not been proved.

The large copper production of Bingham has heretofore been derived chiefly from the lenticular deposits first mentioned, such being worked by the Utah Consolidated Mining Company (Highland Boy mine), the United States Mining Company (Old Jordan, Telegraph and Galena mines), the Bingham Copper and Gold Mining Company (Commercial, Dalton and Lark mines) and the Boston Consolidated Mining Company. More recently the production of copper from the disseminated ore in the monzonite has been inaugurated by the Utah Copper Company, which erected a 500-ton dressing works in main Bingham cañon. The operation of this property has been successful, and it is now planned to erect a new mill of large capacity on the shore of Great Salt Lake. The success of the Utah Copper Company has also led the Boston Consolidated Mining Company to undertake the exploitation of the large bodies of cupriferous monzonite, which exist in its property.

This monzonite of Bingham contains from 1 to 1.4% copper. In a statement by Samuel Newhouse, president of the Boston Consolidated, to his stockholders, advising the erection of a 2,500-ton dressing works (which has now been decided upon), the cost of production is estimated as follows: Mining with steam shovel, 40c. per ton; milling, 35c.; smelting, 20c.; freight and refining, at 2c. per lb. of copper, 42c.; selling and general expense, 16c.; total, $1.78. Estimating a copper content of 1.4% in the crude ore and a recovery of 75% in dressing, the yield per ton of ore would be 21 lb. of copper, worth $2.52, with copper at 12c. per lb. and 20c. for gold and silver value, making a total of $2.72, giving a net value of $0.94 per ton of crude ore. The cost of plant of 2,500 tons daily capacity is estimated as follows: Railway, $350,000; railway equipment, $100,000; power plant for 5,000 tons, $150,000; mill, $450,000; two steam shovels, $25,000; reservoirs, etc., $50,000; total, $1,125,000, on which interest at 6% and amortization at 10% would come to about 24c. per ton of crude ore.

The working of the very low-grade copper deposits of Bingham will introduce there a condition of mining analogous to what exists at Lake Superior where immense tonnages of copper ore of very low grade are worked, and in the disseminated district of southeastern Missouri, where low-grade galena ore is exploited on a large scale, the value of the crude ore in both cases being not very different from that of this disseminated copper ore of Utah, the Utah mines having the great advantage, however, that their ore can be extracted to a large extent by open-cut work. Other companies in the district, besides the Utah Copper Company and the Boston Consolidated, have large deposits of this low-grade ore, and the operations of the pioneer companies will, therefore, be followed with especial interest.

It has not yet been fully determined where the new plant of the Boston Consolidated will be erected, but it is not unlikely that a location near the shore of Great Salt Lake, where the Utah Copper Company is to build its plant, may be decided upon. There would be some advantages in putting the mill at that point, because the American Smelting & Refining Company is planning to erect its copper smelter in the same vicinity. There would, therefore, be a saving in hauling the concentrate. Either the Rio Grande Western or the Salt Lake route will build a line for the Utah Copper Company from the mines to the lake.

A case brought up in the English courts where the roadway settled, as a result of working beneath it, was decided May 30, the mine operators being required only to restore the road to as good condition as before, and not being obliged to pay the costs of bringing it up to its former level.

Corundum concentrate, which on chemical analysis was found to be ground corundum, has been held to be dutiable as "emery ground or pulverized" at 1c. per lb., under paragraph 419 of the Dingley tariff, and not free of duty as "emery ore," according to a decision, April 28, 1905.

A few tenths per cent of vanadium raises the elastic limit of a mild structural steel one-half without impairing its ductility.

Packing Mine Workings.

A discussion of this subject before the South Staffordshire and East Worcestershire Institute of Mining Engineers, *Colliery Guardian*, June 16, 1905, contains much of interest. Professor Redmayne, president of the Institute, in commenting on a paper entitled, 'A Method of Packing Excavations in Coal Seams by Means of Water' (by E. O. J. Brown), said that the paper describes a process which is employed in America and also extensively in Germany.

This method of flushing mine workings consists in conveying underground, through pipes, in suspension in water, fine-grained material which is deposited where required; the water then filters away through the dams, eventually reaching sumps, from which it is pumped to the surface again. In a day or so the dams are removed, and the packing remains firm. This method of packing in Silesia, thus far, has been satisfactory; and most of the collieries, with suitable material at hand, are beginning to try the process.

The advantages are: (1) All the coal is recovered; (2) dangers from spontaneous combustion are practically nullified; (3) pressure on pillars in course of removal is reduced, and the risk of accident is thus minimized; more timber is recovered and less crushed coal is produced; and (4) damage to the surface is avoided, so far as ascertained.

Compared with hand packing, it is much more efficient. Where good material is used, it occupies, finally at least, 90% (as against about 60% with hand packing) of the space occupied by the original seam; and it is less costly.

The chief disadvantages of mine packing by water are: (1) The water damages the mine pumps; and (2) there may be stoppages of the water supply at the surface during the winter. However, the first disadvantage might be avoided by pumping the mine water separately. [At some Pennsylvania mines, fine coal dirt filtering through with the water used for packing finds its way into the pumps, to their injury]. The cost of the process at one colliery was from 5½ to 6 d. (11 to 12 cents) per ton of coal mined by the process; this cost includes everything, except water and sand, which are free. The saving resulting from the reduced timber-cost and increased output per miner alone brings down this cost of packing to 2½d. (5 cents) per ton, and the balance is more than covered by the other advantages as enumerated.

The method given above of packing the goaf appeared to Professor Redmayne to be peculiarly adapted to the conditions of mining in the South Staffordshire district, with its troubles from gob fires, subsidence, etc.; the greatest difficulty is in finding a suitable packing material.

A Large Pumping Plant in Tasmania.*

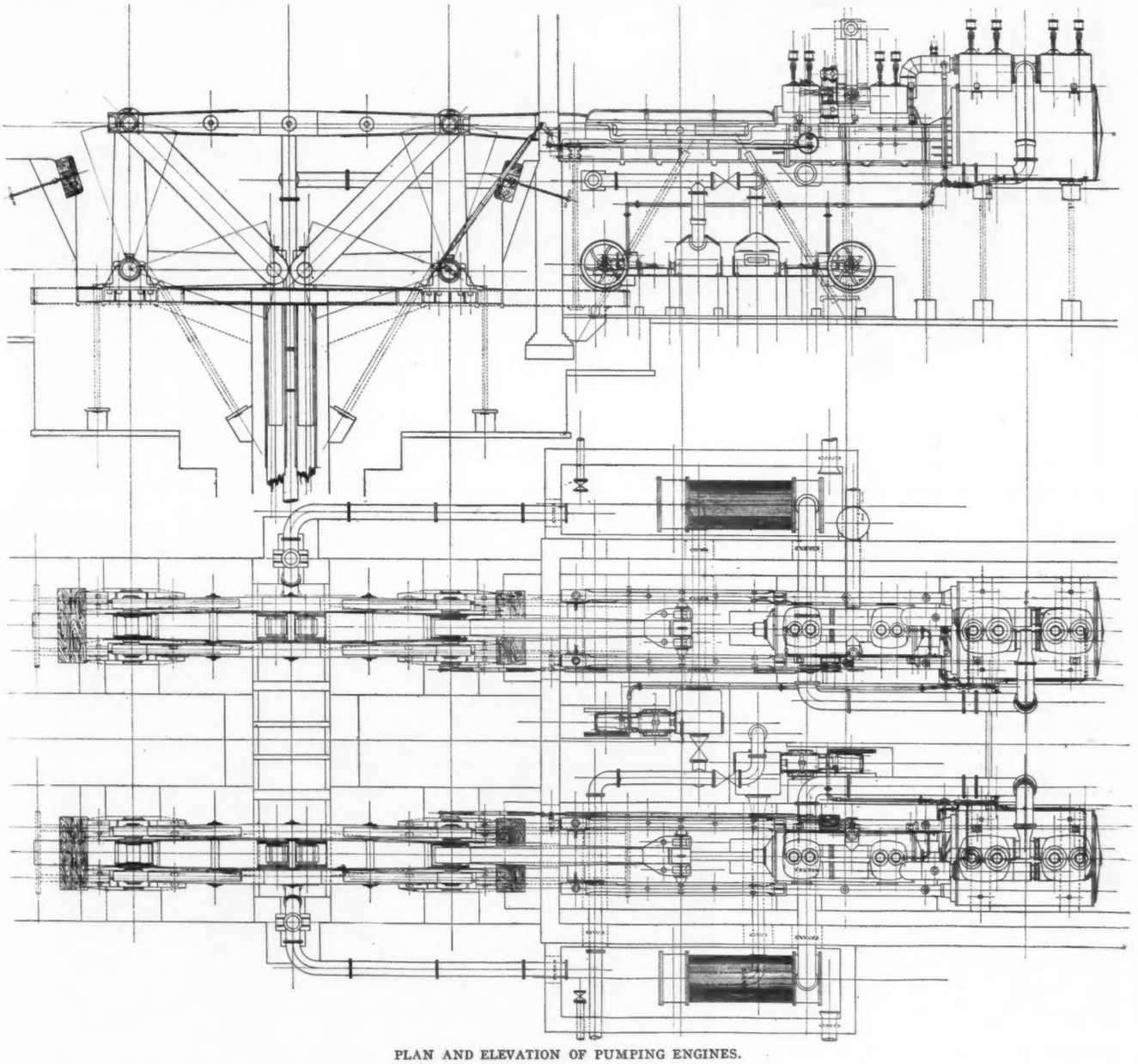
When the new English company, which took over the Tasmania gold mine, near Launceston, some 18 months ago, decided to equip the mine at once with a powerful pumping plant, much interest was evinced in engineering circles concerning the particular plant which the company would adopt for its requirements. It was generally known that the old company had parted with the mine, owing to the water difficulty. The amount of incoming water under normal conditions hardly exceeds 3,000,000 gal. per 24 hours. However, in driving the levels, especially in a westerly direction, a large inrush of water has been experienced, which the old pumping plant was unable to handle.

With this emergency, and after a careful investigation of the circumstances and the demands of the proposition (which involved the raising of 8,000,000 gal. of water from a depth of 2,000 ft.), the managing engineers, Messrs. John Taylor & Sons, London, in consultation with Messrs. William Frecheville and Richard Provis, decided on a modern Cornish pumping plant, built by Messrs. Hathorn, Davey & Co., Leeds. The equipment consists of three separate compound differential condensing engines, each of which is capable of raising 2,200,000 gal. of water per 24 hours at usual working speed, which, however, in emergency can be increased to 2,800,000 gal., without unduly straining the machinery. The first unit has been installed, and is now in working order at Hart's shaft, pumping from the 1,000-ft. level, in two lifts of 500 ft., while the other two units will be erected at Grubb's shaft, which is being sunk at present to a depth of 1,250 feet.

The steam cylinders of the new pumps are 54 and 108 by 120 in., and the total weight of the engine is about 750 tons.

The admission and exhaust steam valves are of the double-beat Cornish type and are actuated by gear controlling the admission and release of the steam throughout the stroke, and are therefore very sensitive to regulation, the cut-off changing to suit any small variations in steam pressure. This gear also constitutes a great safeguard in case of loss of load.

In addition to the differential gear proper, a pausing gear is provided, consisting of a small subsidiary steam cylinder which actuates the admission valve of the differential-gear engine, and by means of



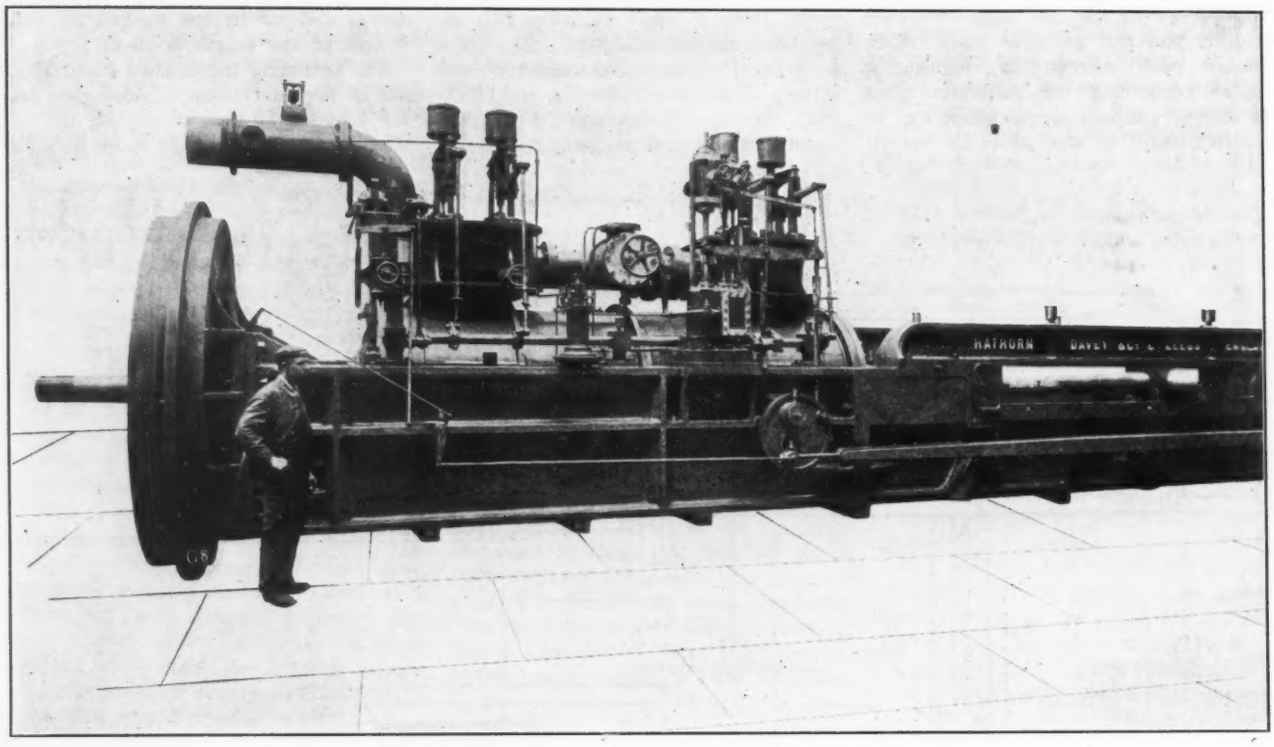
PLAN AND ELEVATION OF PUMPING ENGINES.

*This article is based on notes furnished by Mr. E. A. Weinberg, mining engineer, of London, and C. F. Heathcote, superintendent of the company.

which the gear engine, and therefore the main engine, can be made to pause for any desired length of time, thus enabling the engineer in charge to regulate the number of strokes per minute to suit the flow of water into the mine. This pause also enables the pump valves to settle on their seats by gravity, instead of being forced down by the return stroke. The engines are fitted with separate surface condensers, which have brass tubes and brass tube-plates and independent air-pumps.

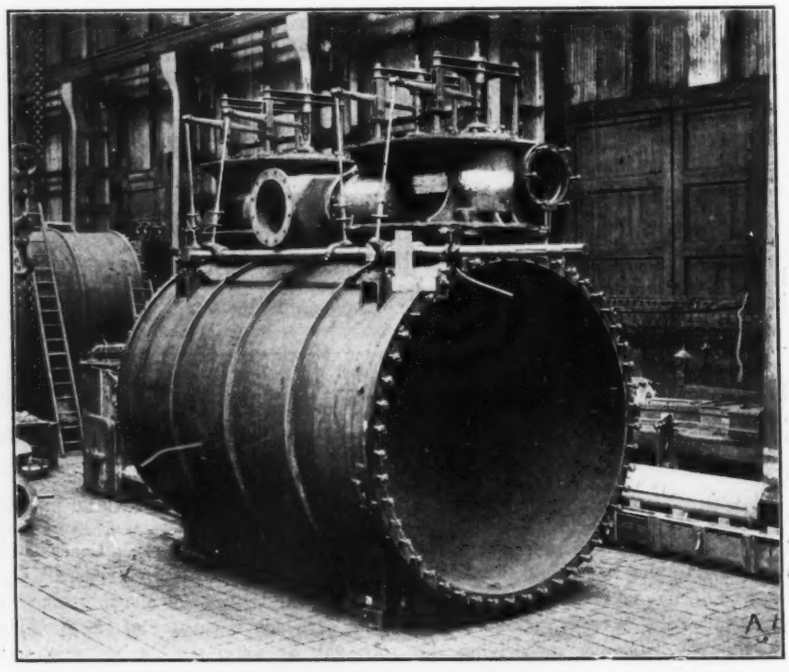
The pumpwork proper is of massive character, the quadrant arms are 15 ft., center to center, and are built up of steel plates blocked with pitch pine. The main quadrant bearings are 18 in. diameter by 24 in. long. The valves are double-beat multiple, in separate boxes, with eight suction and eight delivery valve-boxes to each plunger. By this means the advantages of full area of waterway and small valves and valve-boxes are secured, no part being too heavy to be readily handled by one man without the use of tackle. The weight of each rod to the 1,000-ft. level, together with that of the plungers, is 168 tons. The diameter of the plungers is 20 in., and the rising main of steel 16 in. internal diameter, with welded flange joints.

In a deep installation of this character the weight of the spear rods and plates is in excess of that of the water to be forced to the surface. This does not injure the efficiency of the plant, as one set of spears is rising while the other is falling, and therefore the actual work done by the engine is not affected; indeed, a certain amount of surplus weight is advantageous. Although not affecting efficiency, excessive weight is detrimental, as putting too much stress upon the upper rods; balance-beams are therefore provided in the shaft side for taking up the surplus weight of the spears in the same way as usual in the Cornish engine. The usual working speed is five and a half strokes per minute; the emergency speed is seven strokes per minute; but the pump has already been run for an hour's trial at eight strokes per minute. Balance bobs will be placed later on each rod at the 400 and 900-ft. levels, weighing 40 tons and 30 tons respectively, and others further down as the shaft is sunk deeper.



ENGINE WITH LOW-PRESSURE CYLINDER REMOVED.

The spear rods from the surface to the 500-ft. level are 22 in. square, and in lengths of 47 ft., the joints being made with steel plates and bolts as usual; from the 500 to the 1,000-ft. level, the rods are 18 in. square. The plungers are in direct



LOW-PRESSURE CYLINDER AND VALVES.

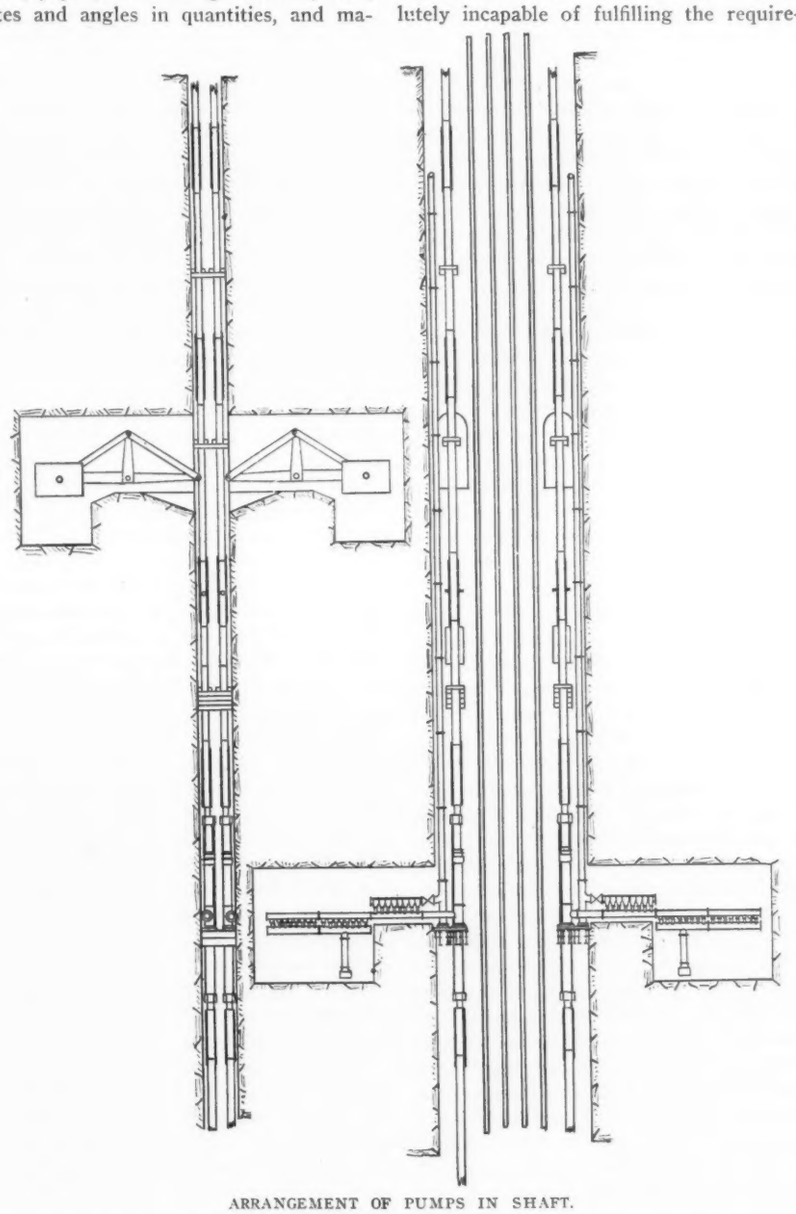
line with the rods, the continuation of the rods below the plungers being carried by two quad rods.

The contract price for the three units was £45,000 in England; but freight, duty, accessories, boiler power and cost of erection will probably bring the total cost of the installation to about £120,000.

Steel Making in Japan.

The Imperial Steel Works at Wakamatsu, Japan, are turning out rails, bars, plates and angles in quantities, and machinery is being ordered for the production of telegraph wire, rivets, bolts, nuts, etc. At present the whole of the production goes to meet Government requirements. It is probable that but for the war most of the rails imported during the past year would have been manufactured in Japan at these works. About 18,000 tons of 60-lb. rails were manufactured there for use in building the military lines in Korea, besides many thousand tons of lighter rails. The United Kingdom's share of the rail import to Japan is reduced to 10%, and the largest share has fallen to America. Imports of wire nails, however, have increased, probably because a native factory has practically ceased working.

The crude method of ventilating by means of a heated airshaft, which once served fairly well to meet the needs in shallow mines of small extent, is absolutely incapable of fulfilling the requirements where the workings are deep and extended and the passages are frequently miles in length. With the extension of the workings came a demand for more positive means, which was met by the substitution of the fan-blower or exhauster; first known to have been applied for the purpose in the fifteenth century. Today no greater refinements in fan design are to be found than in the modern mine-ventilating equipment.



ARRANGEMENT OF PUMPS IN SHAFT.

Kentucky Coal.

The preliminary report of Mr. C. J. Norwood, State inspector of mines, gives the coal production of Kentucky for the year 1904 as follows, in short tons: Western district, 4,121,564; southeastern, 3,431,125; northeastern, 614,635; total, 7,167,324 tons. This is a decrease of 30,927 tons, or 0.4%, as compared with 1903, when the total was 7,198,251 tons. The disposition of the coal mined in 1904 was as follows:

	Tons.	Per ct.
Used at mines	162,423	2.3
Sold locally	201,006	2.8
Made into coke	135,973	1.9
Shipped from mines	6,667,922	93.0
Total	7,167,324	100.0

Of the coal shipped from the mines, 3,453,151 tons, or 51.8%, were sold at points within the State; while 3,216,173 tons, or 48.2%, were sent to points beyond the State limits. The average price realized at mines was $2.03 per ton for cannel coal and 98.51c. for other coal; giving a general average of 99.37c. per ton.

The output for 1904 was produced by 141 companies, operating 172 mines, and employing 13,906 persons, of whom 10,991 worked underground. The average number of 10-hour days worked in each district was as follows: Western, 174; southeastern, 184; northeastern, 173. The number of hours constituting a working day varies. The average coal mined per employee was 515 tons.

Machines are largely used in the Kentucky mines. The coal mined by machine in 1904 was 3,768,183 tons, or 52.6% of the total.

The coke made in 1904 was 62,722 tons, a decrease of 56,876 tons, or 47.6%, from 1903. The coal used in making coke was 135,973 tons; showing the high average of 2.17 tons to the ton of coke.

F Münter states (German patent 157,881) that a steel of special hardness is produced by subjecting the molten metal to a blast of pure nitrogen.

Blast furnace gas-engines, direct-connected to electric generators, are employed in a foundry at Esch, Luxemburg, the pair of horizontal single-acting 35.4 by 41.3-in. cylinders being on opposite sides of a 19.7-ft. flywheel. Their speed is 120 r.p.m., and they are guaranteed each to develop a continuous output of 660 h.p. with blast furnace gas of 96 B. t. u. calorific value per cubic foot, and a dust content of 0.001 oz. per cubic foot.

At Seraing, Belgium, two blast furnace gas-engines of 200 h.p. each operate generators for running cement mills. A 1,500-h.p. double acting, four-cycle engine, has just been installed. Its speed is 100 r.p.m., the bore is 39.37 and the stroke 47.63 in. Two single-acting tandem engines of 700 h.p. each have bores of 35.43 and strokes of 39.37 in. and operate at 139 revolutions per minute.

Treatment of Cassilis Ore.*

BY FRANCIS B. STEPHENS.

The Cassilis mine, Victoria, Australia, of which I have been manager for the last two years, made the first serious attempt to cope with the difficulties attending the treatment of the refractory ores of that district. Fair success resulted. About 85% of the value of ore crushed was obtained at a cost that compares favorably with mines treating much simpler ores.

While the ore at the surface in this district is rich (giving returns as high as 10 oz. to the ton), there is a steady falling off in value in depth; at 600 ft. the decrease in gold content becomes serious. So marked is this, accompanied as it is by an increase in the refractory nature of the ore, that many smaller mines closed down after reaching 300 ft.; and, at the Cassilis, only improved methods of extraction permitted work to be continued. The main body of ore comprises a band of dense sulphides, consisting of arsenical pyrite, iron pyrite, zinc blende, galena and carbonate of iron; while antimony, manganese, copper and tin occur in proportions usually of less than 1% each. The gold value ranges from 1 to 10 oz., averaging from 3 to 5 oz.; a hand sample subjected to magnetic separation showed as follows:

Products of Magnetic Separation.	Per Cent by Weight.	Gold per Ton.	Silver per Ton.
		oz. dwt.	oz. dwt.
Pyritic concentrate (chiefly iron and arsenical pyrite).	75.2	3 19	1 17
Quartz and gangue.....	18.3	Nil.	Nil.
Zinc product.....	3.6	2 5	2 12
Lead concentrate.....	2.9	0 13	0 14
	100.0		

The various minerals in this lode occur sometimes banded, but usually as a coarse mixture; in places one of the minerals will occur in large masses to the exclusion of the rest; galena and zinc blende are found in this way. Lying next to this sulphide band there is usually a band of breccia heavily charged with fine-grained arsenical pyrite and carrying about 7 dwt. of gold per ton; this is the most troublesome of all the minerals to treat, owing to the amount of slime made in crushing.

Outside these two layers, and next to the country rock, the filling of the fissure consists of a green talcose rock and green quartzite, more or less charged with iron pyrite of low grade. Large masses of mica and talc are met throughout the gangue, and crystals of andalusite occur in bunches. In the upper levels, where tourmaline granite occurs, the reef carries a considerable amount of tin, concentrate showing as much as 3%; in the lower levels no tin was noticed. Drilling in the sulphides liberates poisonous gases which sometimes drive the men away from the machines and bring on violent vomiting, no doubt due to arseniureted hydrogen. In the outcrop, orpiment (yellow arsenic sulphide) was common, and was usually a sign of richness; samples of pure orpiment have been obtained assaying up to 62 oz. of gold per ton.

The plant used for treatment consists of a jaw crusher, 16 in. by 9 in.; self-feeders; 20 head of 1,000-lb. stamps; silvered copper plates; 4 three-cone hydraulic classifiers; 6 Wilfley tables and 4 Berdan grinding pans. Tailing goes to settling tanks for future cyaniding; concentrate is roasted for chlorination, while galena is shipped to smelters after grinding. A drawback to chlorination in this district has always been the large percentage of galena carried by most of the ores; and copper is also occasionally troublesome. Zinc blende, after roasting, is quite amenable to chlorination, our concentrate sometimes carrying 20% of zinc.

The galena is separated on the Wilfley tables and subjected to special treatment, thereby getting over the trouble in the furnaces due to fusion of the sulphides, a matter of some consequence with galena, running sometimes as high as 7% on the ore crushed.

The ore is crushed to pass an 18 by 20-mesh screen; after crushing, the pulp is run over silver-plated copper plates, with a fall of 1½ in. per ft. to keep the plates clear of fine galena.

The amalgam yields a return of 1-5 to 1-7 of smelted gold. Before the employment of classifiers, great losses of gold and mercury took place; but since their introduction, the gold and mercury are caught in the galena streak on the Wilfleys. Only 20% of the total gold is obtained by amalgamation, though the concentrate shows no visible gold on panning, except when rusty patches are struck.

Each five heads of the battery have a series of three conical sheet-steel hydraulic classifiers, under a head of 20 ft. of water, and with diameters respectively of 12, 18 and 24 in. The product from the four topmost compartments was run over two tables, the middle over two, and the fine over one table. When the concentrate was made in heavy quantities (using a larger amount of water than was customary) an overflow to waste had to be made at the third cone to prevent flooding the Wilfleys, which before the introduction of classifiers had proved a serious trouble.

The Wilfley tables are set on solid foundations, and all wear is taken up at once. In warm weather there is a tendency for the wooden riffle-slats to buckle between the tacks and allow fine concentrate to pass into the tailing; to avoid this the slats are made of specially selected wood.

With the adoption of classifiers, no occasion was found for use of Raff wheels, which were thrown out. At the end of the tables an inner sliding box was arranged, in the usual concentrate box, for the purpose of catching the galena. This concentrate contained a quantity of arsenical pyrite and was daily re-concentrated on a separable table, reserved for this purpose; three products were made.

Of these, the head (containing 40% of lead) went to the grinding pans; the middling (containing 15 to 20% of lead, 15 to 20% of arsenic, and 8 oz. of gold per ton) was shipped to the smelters; and the third went back to the ordinary concentrate for chlorination. Smelters, by the way, paid for gold, silver and lead, but deducted 1s. per unit for arsenic. The galena heading was ground in a Berdan pan, with mercury and a little cyanide, for a period of 12 hours or less; the ground pulp, when removed from the pans, was stirred in a tub and allowed to settle; then the top sludge was removed, put into jute bags to drain, and shipped to smelters.

Settling at the bottom of the tub, after removal of the bulk of the mercury and amalgam, was returned to the next charge, and in this way the mercury loss was kept at a minimum (averaging for all operations at the mill from .75 to 1.05 oz. per ton crushed). The lead sludge from the grinding carried about 15 oz. gold, 40% lead and 10% arsenic when shipped (the gold value before grinding being sometimes as high as 60 oz.). The stamps were run at 96 to 100 drops per minute with a 6- or 7-in. drop.

A more elaborate system of concentration would not, under the peculiar circumstances, have proved commercially advantageous. When the plant was run without hydraulic classifiers, great losses of concentrate took place, to test which a trial of ore running 28 dwt. was made.

The steam of pulp was divided, one-half being concentrated without previous classification and the remainder being run through classifiers first; the result was that tailing in the former case went 7 dwt., and in the latter, 3 dwt. The capacity of the tables was increased fully 25% by the use of classifiers.

The sand (freed from concentrate by magnetic concentration) proved barren, so that this was an ideal ore for a complete system of classification.

In due time, the canvas slime tables were abandoned, as the values saved did not pay for the labor, and the slime was settled in a series of terraced dams which assayed as follows: Top dam, 4.5 dwt. of gold per ton; middle dam, 4.5; bottom dam, 5.0; overflow, 12.0.

The amount of solids overflowing amounted to only 1% of the amount crushed. No attempt was made to treat the slime separately, as the quantity accumulated was not sufficient to warrant the addition to the plant.

Chlorination Treatment.—As it was usual to make from 15 to 20% of concentrate (running from 3 to 4 oz. of gold and containing over 50% of the total gold value of the ore crushed), chlorination

*Read before Institution of Mining and Metallurgy, May 18,1905.

had to be run as cheaply as possible. The following is the analysis of a sample of concentrate (including galena and representing the average over a week, although the variation was very great for all the constituents): Lead, 4.48%; zinc, 5.26%; iron, 31.56%; arsenic, 15.16%; sulphur, 31.63%; unestimated, 11.91%; total, 100.00%.

The writer, in taking charge, found that the short hand-rabbled reverberatories were quite unsuited for the work, on account of the concentrate fusing too easily. As the galena could not all be separated, some form of mechanical furnace was absolutely necessary. Chlorine solution (generated from bleaching powder and sulphuric acid) was used in 10-ton open wooden vats; after comparative trials against gas, this method was retained as offering many advantages, being actually cheaper for this ore, while the extractions were the same for both.

Two Edwards' mechanical furnaces with 60-ft. hearths were installed, with excellent results. One man per shift of eight hours attended to all the work of two furnaces with a weekly capacity of 30 to 35 tons each. The furnace man charged the hoppers from the battery hoppers, stoked his two furnaces, and looked after the engine and dynamo for lighting the works. The fume was led into a brick flue 300 ft. long and 5 ft. by 4 ft. inside, with a 40-ft. iron stack 2½ ft. in diameter.

The height of the top of the stack above the hearths of the furnaces was 70 ft.; small dust chambers were built between the ends of the furnaces and the flue. The iron stack did not suffer at all, and it acted as an excellent arsenic condenser. It was necessary to clean the whole length of the flue every three months, about 30 tons of deposit being obtained.

The flue dust for the first 100 ft. consisted of partially roasted concentrate and arsenic soot, assaying about 3 oz. of gold per ton, or about the same value as the concentrate roasted. The last 200 ft. of flue contained arsenic soot comparatively free from concentrate, and assayed 7½ dwt. The arsenic at the base of the iron stack had to be cleared out weekly; it was a matter of serious consideration what to do with this material in a mountainous, rocky district. Finally it was buried with the residue from the chlorination works. All attempts to re-work the rich flue dust with the raw concentrate by re-roasting failed; the extractions fell off greatly; so this material was placed in heaps to weather, and was afterward roasted and treated by itself.

Just before the finish of the roast, 1 to 1½% of salt was added to the ordinary concentrate in order to obtain a sweet roast. No evidence of *loss* of gold by volatilization could be obtained.

The roasted ore discharged into a push conveyor which carried the ore to a steel bucket elevator; this took it to a cooling bin over the treatment vats. Dry wood was used as fuel; any green sticks getting in generally had the effect of throwing back the charge to magnetic oxide. Badly roasted ore set hard in the vats, while well-roasted ore did not. The ore in the hand-rabbled furnaces always roasted black; while in the mechanical furnaces, it roasted cocoa-color, but never bright red. The brighter the color obtained on roasting, the better the roast; although the magnet failed to show any difference. Practically no zinc was sent into the flue, the heat not being high enough; it was mostly in the roasted ore as sulphate or basic sulphate.

During treatment, the zinc was almost all leached out of the vats by the sulphuric acid, but the amount of zinc seemed to have no influence on the extraction, other than to prolong the period, through packing of the sand in the vats as the zinc leached out. Vats holding 10 tons, and made of 3-in. Kauri pine staves, were used.

An ordinary graded-pebble and sand bottom was used; it was replaced when it showed signs of clogging. Strange as it may seem, the filter bottom and the lead-solution pipes used to get clogged with magnesium sulphate, but a little hot water, free from sulphuric acid, soon cleared this out. The chlorine solution used had a strength of .09 to 1.2% of chlorine, and from .5 to 1% of sulphuric acid, over and above the quantity required to combine with the bleaching powder. In this way, many deleterious compounds were leached out or rendered harmless, most of the copper present being taken out in the first solution, leaving the ore in a good condition for the next solution.

The first solution usually had all its chlorine used up; but, on the well-roasted ore, the second solution run off showed chlorine freely. The solutions were not allowed to remain long in contact with the ore, as otherwise the chlorine became used up, and the gold already dissolved was re-precipitated in the vat. Solutions were run on for six days, or till the off-flowing solution failed to react well for gold. The solutions were allowed to settle in an intermediate vat before precipitation.

This vat was fitted with plugs at every 6 in. for drawing off small portions for assay, and an extra check (on the amount of gold due at the clean-up) was obtained. Ferrous sulphate was used as a precipitate, and was made from old battery screens. A considerable amount of basic iron sulphate, etc., settled in the precipitating vats; at clean-up time, it was taken into solution with sulphuric acid. Copper gave very little trouble, but it seldom went over 1 or 2% in the concentrate. Owing to the use of such weak solution, not much chlorine passed into the atmosphere. Less chlorine was consumed than if dry gas had been used on this ore.

An extraction of about 85% was obtained on well-roasted ore, the loss amounting to 1 to 2 dwt. per ton crushed. Shipping to smelters and treatment charges amounted to £6 per ton; while our costs, *plus* the value of gold left, did not amount to half that. The drawback to the use of 10-ton vats was the fact that a little carelessness on the part of a furnaceman spoilt the extraction of a whole vat. The ore at the furnace discharge was tested every five or ten minutes, and none but reliable men could be employed on this work.

Numerous experiments were carried out to try and better the extraction, but with no success (although they led to a steady decrease in the cost of chemicals). Fine grinding after roasting gave no better results. Dry gas gave the same extraction as chlorine solution; but the method was more expensive and decidedly more troublesome to work.

The cream-colored mud (which settled in the intermediate-solution vats before precipitation) was of a very complex nature, consisting largely of basic sulphate of iron and up to 20% of manganese and arsenic. On treating this mud with sulphuric acid, it all went into solution and left a small amount of black residue. This turned out to be gold, but was quite insoluble in chlorine water or cyanide, even on long standing. Doubtless this was due to the chemical condition of the gold; it was precipitated in the treatment vats if the solution was allowed to stand long in contact with the roasted ores; no lengthening of the time of treatment on a vat of this description would give a good extraction.

To test this, a solution of gold chloride was poured on a sample of well-roasted ore and allowed to stand all night. In the morning, all the gold was precipitated and could not be re-dissolved by chlorine water; yet this same ore gave good extraction if the first solution was run off quickly. At one time solutions were only run on, on two shifts; but, after the facts narrated were proved, additional solution on the third shift was started, with very beneficial results. What the chemical condition of this precipitated gold was, the writer is unable to state, as sufficient material was never collected to determine it.

Treatment of Tailing.—Cyanide works were erected for the treatment of the accumulated tailing, but this leached badly, owing to the large percentage of talc and mica scale and the nature of the slime. Slime running high in concentrate settled in large quantity with the coarse sand, in spite of the dams being kept narrow (most of the tailing was made before the introduction of classifiers), and this slime percolated badly and gave a poor extraction even with agitation.

The sand could be separated in layers like leather; it had exactly the appearance of mica slate. A trial was made of direct filling from the mill, using a Butters' distributor, but with very unsatisfactory results, owing to the amount of high-value

slime that had to be thrown away to get a leachable product. The following analysis of a vat settled in this manner shows how unsuited the tailing was for a direct-leaching process:

Retained by	40 mesh	.....	14.4%	at 4	dwt.	per	ton.
"	" 60 "	.....	20.7%	" 2.75	"	"	"
"	" 80 "	.....	9.1%	" 2.0	"	"	"
"	" 100 "	.....	20.7%	" 2.25	"	"	"
Passed 100 mesh		.....	35.1%	" 6.25	"	"	"

Consequently a great amount of preparatory work, in the way of drying and mixing, had to be done in the dams to get a product that would leach. An ordinary agricultural scarifier and an earth scoop were used for this work, which could only be carried on in dry weather.

The sand, after filling, was water-washed for eight to twelve hours to remove magnesium sulphate, which was present in large quantities. The wash water coming off showed no free sulphuric acid and not a trace of iron salts. Considering the large quantity of iron and arsenical pyrite in the tailing, this was at least remarkable, and that the pyrite had oxidized, was shown by the large amount of magnesium sulphate. About 70 lb. of caustic soda was used on a 90-ton vat, and the cyanide solution was made up to .25% of KCy.

Caustic soda, unfortunately, dissolves arsenic compounds readily, especially orpiment and hydrated arsenate of iron; these were present in considerable amount, and the solution entering the zinc boxes carried .5% of arsenic, causing a heavy consumption of zinc. To obviate this difficulty, the solution was not allowed to remain in contact with the sand, and matters improved very much.

Solutions which ran off clear, on standing became milky with magnesia hydrate; this precipitate settled thickly on the zinc and spoiled its efficiency. Extractions ranged between 60 and 65%, and the consumption of cyanide kept at the moderate amount of 75 lb. A treatment of 72 hours was given, but a longer treatment gave no better extraction. The use of an oxidizing agent in experiments increased the extraction 10%. The water supply destroyed permanganate readily; organic matter in the water may have accounted for this, as the water came from peat bogs. If the ore were leached with distilled water, a heavy consumption of permanganate followed on the magnesium sulphate, which seems rather strange. The table given herewith shows the mining, milling, chlorinating, cyaniding and smelting costs (on a weekly output of 270 tons milled and mined, 54 tons of concentrate chlorinated, 300 tons of tailing cyanided from the dams, and four tons of galena shipped for smelting):

MINING.

Average cost of mining, developing and transporting one ton of ore.	$3.660

MILLING.—Tons crushed, 270.

Wages	$0.524
Fuel	0.224
Stores	0.132
General charges	0.276
Cost per ton crushed	1.156

ROASTING.—Tons roasted, 54.

Wages	$0.946
Fuel	1.066
Repairs	0.040
General charges	0.446
Cost per ton roasted	2.498

CHLORINATING.—Tons treated, 54.

Wages	$0.670
Chemicals	1.164
General charges	0.386
Cost per ton treated	2.220

CYANIDING.—Tons treated, 300.

Wages	$0.436
Chemicals, etc	0.200
Fuel	0.084
Cost per ton treated	0.720

SUMMARY.	Per Ton. Crushed
Mining, developing and transport	$3.660
Milling and concentrating	1.156
Chlorinating and roasting	0.944
Cyaniding	0.800
Shipment and smelting charges	0.420
Total costs[1]	$6.980

[1]Figures of this table have been changed to U. S. money at the rate of £1 = $4.80.—EDITOR.

These costs did not include directors' fees and Melbourne-office expenses. Owing to heavy freight charges, these articles cost as follows: Bleaching powder (27 to 30% available chlorine), $240 per ton; chamber sulphuric acid, $52.80; engine wood, $3.36 per cord of 125 cu. ft.; furnace wood, $3.84. Explosives cost as follows: Gelignite, $15 per case, at the mine; gelatine dynamite, $17.40; blasting gelatine, $19.80.

The cost of erecting this plant (including office buildings, housing, etc, but exclusive of cost of air compressor) was about $96,000, and was all paid out of profits as the work proceeded, showing that excellent profits could be made by ordinary milling methods from what had been considered by many to be only a smelting proposition.

Labor Efficiency in Shoveling.

H. E. Scott, in the *Journal* of the Worcester Polytechnic Institute, states that in unloading iron ore at the Lake Erie docks, the shovelers are paid by the ton, and the following records have been made: The prices paid are 13c. per ton on straight work, and a maximum of 18c. per ton cleaning up, after 80% of the cargo has been removed by automatic machines. Men working at the 18c. rate have made as high as $12 per day of ten hours, which means that 6.67 tons of ore were shoveled in one hour. Working at the 13c. rate, with eight men in the hold shoveling into one-ton buckets, each man can handle from five to six tons of ore per hour, and sometimes a rate of eight tons per hour has been reached, the daily wages running up to $6.50 to $7.80.

Ordinary calcined magnesite brick is the best material for basic open-hearth furnaces and cement kilns.

The consumption of fuel in New York city in 1903 was approximately 6,000,000 tons of anthracite, and 3,000,000 tons of bituminous coal.

Boric Acid as Flux.

W. A. Caldecott (in a communication to the Institute of Mining and Metallurgy) reports that he has found that boric oxide or fused boric acid yields a very fluid slag with zinc oxide, either alone or with half its weight of borax. The presence of an alkaline oxide appears to prevent segregation of the various metallic borates in a borate slag on cooling. The difficulty which prevented its use in crucible fusions was the bubbling caused by the sulphuric anhydride displaced by boric anhydride at a red-heat.

While the slag, formed by the use of boric oxide alone, was so fluid as to be almost gold-free, yet without sand it is very corrosive to clay crucible liners. Similarly, in the pan furnace, a slag containing borax rapidly dissolved magnesia bricks, and chrome-iron bricks also were reduced and corroded by the fluxed charge of zinc-gold slime when fused.

The recovery of boric acid from slag by acid treatment is an attractive problem; but nowadays crucible slag from smelting of zinc-gold slime is usually worked up in Johannesburg in a lead pan furnace with other materials; it serves as a flux, besides yielding up the precious metal.

In reference to the volatilization of gold by calcination of zinc-box precipitate before smelting, he stated that he had run down equal weights of dried precipitate with litharge and fluxes, with and without preliminary calcination, in the same respective crucibles, but had not been able to account for as much gold (from lead-bullion, slag and crucibles) in the first case as in the second.

On melting somewhat base cyanide bullion and pouring with slag cover, the adhesion of a pure borate slag to the surface of the bar is much greater than if a fairly large amount of silicate is also present. If a graphite crucible is used, a film of graphite flake, allowing ready detachment of slag, seems to form between metal and slag in the molds.

J. Matuschek reports (*Chem. Zeit.*, 1905, XXIX, 510-511) that when certain metallic sulphides, including galena, stibnite, copper glance, copper pyrite and argentite, are heated with sodium nitrate, a violent reaction takes place, usually with a production of metal from the sulphide, but not always. Potassium nitrate appears to act more powerfully than sodium nitrate.

According to J. Matuschek (*Chem. Zeit.*, 1905, XXIX, 510-511) a convenient method for the preparation of minium (red lead) is as follows: Potassium chlorate is added to melted potassium nitrate and lead is then introduced; the mixture is heated until no more gas is evolved. The red lead is free from litharge.

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EDITORIAL.

THE SPELTER market is strong, with an upward tendency. The recent floods in a portion of the Joplin district will considerably restrict the production of ore for a while, and the Treasury decision, as to the duty, will somewhat increase the cost of foreign ore. The strong tone of the European market and the satisfactory demand from domestic consumers indicate a sound position for the metal.

THE EXPLOSION OF a powder magazine, struck by lightning, at the West Riverside colliery, near Des Moines, Ia., July 19, whereby five miners were killed, indicates the necessity for the protection of such buildings. The best method of protecting a building against lightning, according to Sir Oliver Lodge in a report to the British Lightning Committee, is to surround it completely with wire netting, suitably grounded. In the case of a small building, like a powder magazine, this is quite practicable.

WE WOULD CALL attention to the two letters, in this issue, from Guanajuato regarding the facts in the case of the recent flood. It is evident that although there was, indeed, a serious loss of life, the newspaper reports were greatly exaggerated as to the damage to mines and mills. We are glad to emphasize the saner and more reliable information of Messrs. Cummings and Shewell, who are on the spot, and who are entirely capable of giving us an authoritative statement of the undisturbed condition of prosperity that attends this noted Mexican camp.

THE STATEMENT of the United States Steel Corporation for the second quarter of 1905 is quite as good as had been expected. The increase of $10,814,391 over the unsatisfactory returns of the corresponding quarter of last year shows the better condition of the trade so far as quantities are concerned; and shows also that this year's policy of encouraging buyers by lower prices has had the anticipated result in larger business. The only doubtful feature in the statement is a decrease in the tonnage of unfilled orders; but this is easily accounted for by the operation of additional plants, and the consequent quicker delivery of material on contracts taken earlier. The turn in the market has come now, and there is little doubt that the third quarter will show still better results.

THE QUESTION of safety catches for mine cages, and in general the prevention of accidents in hoisting, is attracting a great deal of attention, not only in the anthracite coalfields, but also in Europe and other parts of the world. The interest in the subject is manifested by the contributions upon it published in this JOURNAL during the last three months. A commission has been appointed by the mines department of South Africa, which is sitting at Johannesberg, to report on "the safety of persons traveling in shafts." The commission requests information.

The Miner's Inch.

The increasing tendency among engineers to report water flow in terms of cubic feet, instead of the miners' inch, is commendable. The miners' inch had several different meanings and was little understood outside of the localities where it was in common use. The cubic foot is an expression which is precise and commonly understood; it conveys the idea of quantity better than the use of the term 'gallon,' because anyone can picture mentally the volume thus indicated, which is not so easy in the case of gallons, and is still less easy in the case of the miners' inch.

This is argued solely from the general engineering standpoint. In placer-mining districts, however, the miner's inch is a convenient method of measurement, and locally serves a useful purpose, wherefore there is no probability that it will be abandoned, nor is there any good reason why it should be. It is, nevertheless, important that it be made uniform and be recognized as a legal measure. The recommendation to that effect by Mr. C. W. Purington in his excellent report on placer mining in Alaska, recently published by the Geological Survey, will meet with approval.

William H. Nichols.

The London meeting of the Society of Chemical Industry (which was held on July 10 and the next days following) is significant of the Anglo-American breadth of aim, and cosmopolitan representation, which this association is attaining. The tone of the gathering is well represented by the report from our correspondent, Prof. Baskerville, of the College of the City of New York. Noteworthy indeed is the fact that William H. Nichols, who gave the presidential address—and one that was stirring and practical—is one of the foremost of American chemical manu-

facturers, whose election to the presidency of the Society was an honor not only to America, but also to chemical engineering and the commercial ability which makes engineering possible. We commend with special emphasis everything bearing on this union of the chemical trade and engineering of the two largest English-speaking countries of the globe. It will be remembered that Dr. Nichols is the second American to enjoy the honor of chief presiding officer, Dr. Chandler, of Columbia, being the first American recipient. The natural result of this exhibition of good feeling, and of the mutual exchange of hospitality and technique, is shown in the large and growing list of membership in the Society from this side of the ocean.

The Demand for Copper.

It has been apparent for many years that the destiny of our civilization is to be served by electricity—a destiny that in any event cannot be remote. It has been equally apparent that copper (aided somewhat by its colleague and rival, aluminum) must be the carrier of the electric current. The stupendous dimensions of the necessity and opportunity suggested by this observation are matters of daily comment, and yet the conscious genius of trade seems not yet to realize fully the ultimate significance; the market reflects, mainly, a resultant from forces that represent large capital, ambition, foresight—and perpetual timidity. A remarkable feature of the recent copper production is that no great visible surplus of metal has been accumulated. The increasing demands of electric construction and supply still live in a haphazard way, from hand to mouth. Capital cannot afford to trust the future in supporting the expense of large stock locked up. Meanwhile, the immediate demand continues strong, and among the assuring indications of confidence in the market is the increased dividend of the largest copper combination in the country. Whatever may be the motive which prompted this only partially anticipated generosity, it is safe to say that it would hardly have occurred on a falling market.

The Zinc Ore Question.

The question as to assessing the duty on zinc ore imported into the United States has been argued before Mr. Reynolds, the assistant secretary of the Treasury in charge of customs, the view of the miners that such ore should be taxed 20 per cent *ad valorem* being presented by a committee from Joplin, and the opposite by representatives of the smelting interest, among whom, however, certain important smelters were conspicuous by their absence. Mr. Reynolds decided, July 10, that the small percentage of lead in ore imported for the purpose of producing zinc does not bring such ore under the classification of "lead-bearing," to come under which the ore must carry enough lead to form a commercial quantity.

It has not yet been decided at what point the lead content is to be considered as becoming a commercial quantity, which matter is still under consideration, but it is probable that the percentage will be fixed at 5 per cent lead. Any such determination would be, however, purely arbitrary and would be grounded on no sound basis of distinction between lead ore and zinc ore. It would, nevertheless, compel in all cases the payment of a duty higher than a merely nominal figure, and the final decision of Mr. Reynolds is therefore to be considered as a victory for the miners, although there may be still some opportunity for what is really zinc ore to be entered as lead ore.

Calumet and Hecla Expansion.

The Calumet & Hecla Company has, for many years, adhered closely to the policy of developing its own property and such enterprises as are directly connected with it. It has not sought to extend its activities beyond that, and for that reason any statements implying expansion are apt to be received with some doubt. At present, however, evidence is accumulating that the company is more deeply interested in Keweenaw county mining affairs than is generally supposed by the public. Furthermore, the indications are that the present developments are simply the culmination of carefully laid plans which have been maturing for at least two years.

The incorporation of the Manitou and the Frontenac companies with a capital of $500,000 each has already been noted in our news correspondence. These corporations will take over 40,000 acres of mining lands in Keweenaw county, options on which were secured by C. A. Wright, of Hancock, and turned over by him to the City Trust Company of Boston. Besides this block of mineral land, Calumet & Hecla interests two years ago secured large blocks of timber land. At that time only the timber side of the question presented itself to the public, but it now appears that the lands were secured as much for their mineral possibilities as for timber purposes. Through its control of the properties of the old Lac La Belle, Mendota, Eagle Harbor and Amygdaloid companies, the Calumet & Hecla possesses title to the complete shore line surrounding the large body of water known as Lac La Belle, which is connected with Lake Superior by a canal slightly less than one mile in length. The lake is approximately two and one-half miles long and one and three-quarters wide, and will be the northern terminus of the new Keweenaw Central railroad.

The latest acquisition by Calumet & Hecla interests is the old Clark property. Whether title to this land has been transferred to the company, or simply an option taken, has not been made public, but the explorations in progress are under the supervision of Calumet & Hecla engineers. Two diamond drills are in commission near the south of Breakfast lake, at a point about eight miles west and half a mile north of the extreme point of the Keweenaw peninsula.

There is always a tendency to ascribe to a noted concern, like the Calumet & Hecla, plans which are due to its employees as individuals; but the extent to which such appear to have been undertaken, and the declared intention of the company to amend its by-laws in order to permit it to acquire interest in other companies, lends color to the belief that it is indeed planning to extend its operations. Whether this be merely of the nature of a provision for the future, or whether it be an appreciation of the increasing value of copper resources as an asset and a desire to realize the possibilities open to such a powerful interest as itself, any steps that may be taken in the direction surmised are bound to attract attention.

Fire Protection in Coal Breakers.

The systematic provision against disaster in those emergencies, which so frequently arise in anthracite mining, has led the big companies to give considerable attention to more adequate protection for their breakers against fire. A compact wooden structure, containing, say, a million and a half feet of lumber, the beams of which are covered with inflammable

coal-dust and sometimes are oil-soaked, furnishes the ideal conditions for a quick and destructive fire. When any headway is gained, a breaker fire is practically uncontrollable. The location, usually isolated, precludes the assistance of fire-fighters outside of the colliery employees.

The necessity of better protection for breakers than is usually afforded was strikingly illustrated at the Scranton Coal Company's works, within the last year; two of its large collieries were made idle in one month by the breakers burning down. A description of the reconstruction of one of these plants (the Price-Pancoast) was given in this JOURNAL (July 15 and 22, 1905). In that article were described the excellent measures adopted for preventing a recurrence of such a disaster.

The best safeguard against fire is to have an incombustible structure. Next in order is the provision of means to extinguish a fire in its incipiency. For this purpose the Price-Pancoast breaker has been provided liberally with hand fire-extinguishers, water mains and fire-plugs suitably arranged, but most important is the installation of a dry-pipe, open sprinkler system, which is an innovation in breaker construction. The Pine Brook breaker of the Scranton Coal Company was subsequently similarly equipped.

Sprinkler systems have been used successfully in mill construction for a long time; and the mutual fire insurance companies of New England insist on the adoption of some form of that device in the mills they insure. It is clearly of equally advantageous application in breaker construction, wherein it is useful not only as a safeguard against fire but also for wetting down the breaker to abate the dust nuisance. It has become the practice of the Scranton Coal Company periodically to drench the whole breaker by means of the sprinklers, flushing off the accumulation of dust from beams and floors, and incidentally testing the working order of the sprinkler system.

Other large anthracite companies, notably the Lehigh Valley Coal Company, have organized fire-fighting forces for all their plants. A certain number of picked men are trained in the use of the apparatus at the breakers, and are expected to respond at once to whistle signals. In fire-drills, each man is assigned to certain work and trained for the part he is to play in event of an actual fire. These firemen are paid, not only in case of actual fires, but also for the time given in drilling. Particular attention is devoted to training the men by a special officer who makes an annual report regarding the fire department of which he is the head. A breaker fire is a spectacular sight, but an extremely costly one; and in this, as in other dangers, the value of the "ounce of prevention" ought to be fully appreciated.

Loss in Ore Dressing.

In any metallurgical process, the determination of loss of metal is a subject that necessarily receives high consideration, because upon its percentage, together with the cost of performing the process, depends the net commercial result. The precise determination of metallurgical loss is no easy matter, as is evidenced by the many statements of percentage extraction that are manifestly incorrect. This does not necessarily imply dishonesty on the part of the metallurgist, but simply error in methods, and there are many cases of honest surprise at the disclosure of losses previously unsuspected.

There is only one way whereby the percentage of metal extraction can be precisely determined. That is, by comparison between the metal content of the ore put into the works and the content of the valuable products taken out. The result may be misleading for short periods, because of inaccuracy in estimating the content of ore and by-products in process of treatment, and an absolute determination is possible only when there is a clean cut-off. That is, however, seldom feasible, unless the works are going to be closed down for a considerable period, and in practice it is always necessary to make some estimates for ore and material undergoing treatment. The less often the cut-off, therefore, the less likely is the result to be affected by such errors in estimates; but in any case, errors of this character are non-cumulative, and frequent cut-offs are to be recommended. We are aware of instances in large metallurgical plants, wherein metal actually lost has been carried as a credit item on the books, because the fact of its loss had not been determined by a cut-off and taking account of stock.

The determination of loss in ore dressing is in some respects easier than in other metallurgical processes; in other respects more difficult. It is easier in respect to the facility of making the cut-off, inasmuch as there is not a large quantity of material in process of treatment at the same time, and what there is, chiefly in the bedding of the jigs, is a rather constant quantity. On the other hand, the determination of the metal content of the ore that goes into the mill is more difficult, because in the preliminary crushing water is generally used, and after the ore has become wet, danger of error in taking the sample increases. We doubt if there be any good method for the sampling of a stream of ore under that condition. The total cost of the ore-dressing process, moreover, has necessarily to be so comparatively low that it will not stand the addition of expensive sampling methods.

A common method of determining the extraction of metals in ore dressing is by working back, by which is meant the calculation of the assay of the crude ore from the content of the mill products, viz., concentrate, middling and tailing. This is to be condemned, because in taking numerous samples, and calculating back from them, the chances of error are multiplied. That which ought to be the starting point becomes only a matter of assumption, the various items are bound to foot up to 100 per cent, and all chance of discovering any unsuspected loss is destroyed. Another common practice is to determine the content of the crude ore by a grab sample from each car going to the mill, which is obviously inaccurate, it being impossible to sample properly a car full of ore, lumps and fines together, in that manner. The practice, which has been adopted at certain mines, of first crushing the ore in a separate plant, connected with the shaft house, and conveying the product, then of approximately uniform size, to the jig-mill by traveling belt, presents a convenient opportunity for taking a fairly accurate sample from the ore on the belt.

The weighing and sampling of the crude ore that is put into a dressing works is a subject that has not received proper attention, and is one that may profitably be discussed. The loss in ore dressing, even in the best practice, is the largest single item of waste that is suffered from the time the ore is delivered at the surface, and in many cases there is considerable opportunity to reduce it. There are far more works at which no determination of extraction is made than there are at which such an account is kept. It is better to have some figures than none at all, but it is most desirable to have them accurate.

Metallics.

Metallic calcium appears likely to find use as a reducing agent in organic chemistry.

Aluminum bronze can not be rolled unless it be poured at a temperature only slightly above its melting point.

Steel containing 36% nickel has a practically negligible expansion under heating, it being less than 0.05 of that of brass.

The hydraulic method of mining gold-bearing gravel was invented by Edward E. Matteson, a native of Sterling, Conn., and first applied by him in California in 1852.

The miner's inch is a variable quantity, depending upon local custom. According to its best definition, it corresponds for all practical purposes to a flow of 1.5 cu. ft. per minute.

The velocity of the gas rising through a chimney is generally between 10 and 23 ft. per second. At high temperature of the gas the velocity may be as rapid as 40 ft. per second.

In the cupellation of lead buttons, a good temperature for the air in the muffle is 700° C., but if the buttons contain antimony, iron and other impurities, a much higher temperature must be used.

The journal-bearings of some ore crushing machines subjected to especially hard usage should be lined with bronze, but generally babbitt, or a good anti-friction white metal can be relied upon.

Chrome steel plates and mullers made of the same material are used for bucking down ore samples in the Lake Superior iron region. They are tougher and harder than the cast iron plates ordinarily employed.

In several cases where the gritty character of cast iron in thick sections was complained of, while thin sections machined well, it was found that manganese was low, and by increasing it to 0.5% the trouble was removed.

In the dressing-works at Broken Hill, instead of the usual, shaking feeder from the bins to the rolls, large trommels are now employed, the object being to separate all the fine ore possible, avoiding unnecessary wear on, and increasing the capacity of, the rolls.

At the Minnesota mine, near Tower, Minn., diamond drills are used for boring holes for blasting. This is the only mine in the Vermilion district employing diamond drills for that purpose, but it is claimed that the hardness of the ore and the long holes drilled justify the method.

The average composition of a cheap bronze for journal-bearings is 70% copper, 14% lead, 10% zinc and 6% tin. This wears out rapidly because of its zinc content. The best bearing bronze contains no zinc. The more zinc a bronze contains, the more apt is the lead to "sweat" in cooling.

It is on record that an engine at the De Beers mine, Kimberley, South Africa, has hoisted 46 round trips in one hour per single skip, and has maintained an average of 32 round trips per hour for 24 hours, from a depth of 1,260 ft. This was, however, considerably in excess of the regular work of the engine.

Antimonial lead, containing 10% antimony, can be rolled satisfactorily into good, sound sheet without danger of cracking, if the metal be poured at a temperature just above its melting point, but if poured red hot the sheets are likely to crack badly This is due to a difference in the crystallization produced by rapid and by slow cooling, which is common to many metals.

Cement blocks can be made impervious to water by treating with a wash made by dissolving 25 lb. of alum in a barrel of water, following with a wash of soft soap, prepared by mixing three or four pails of soft soap with a barrel of water. This treatment, which goes by the name of the Sylvester process, has been known to make water-tight large reservoirs, laid in concrete, when other methods failed.

Three hundred million gallons of water a day are used at present for the supply of the city of Greater New York. That quantity of water would be sufficient for only 13 hydraulic mines, each using 2,000 miner's inches under head, reckoning the duty of an inch at 2 cu. yd. of gravel. If the gravel averaged a yield of 15c. per cu. yd., the total would be only $7,800 per day, or $936,000 for a working season of 120 days.

In any drying problem, it is important to determine the saturation of the material, the amount of water per pound or per ton which it contains; then to figure the number of heat units necessary to vaporize this moisture, which approximates the latent heat of steam at 212° F., 965 B. t. u. per lb. of moisture; and then to supply a volume of air containing these heat units which will absorb the required volume of moisture or water.

A rough method of finding the temperature of hot-air blast consists in taking out a plug from the pipe conveying it and finding how long it takes a piece of aluminum or zinc to melt in the issuing gas. A simple pyrometer consists of an iron bar inserted into a furnace wall and projecting on either side. A certain amount of cooling takes place before the heat arrives at the end of the bar, where a mercury thermometer will give approximate values.

"Tempered-lead," also called "Noheet-metal," which is sold for anti-friction purposes, is an alloy of lead with about 1.5% of sodium, the effect of the latter being to produce an ingot, which is hard, tough and resonant. It is prepared by adding 2% of sodium, cut into small pieces, to lead heated only a little above its melting point. The ingots should be coated with oil, or paraffine, and when remelted should be covered with rosin to prevent oxidation.

The scale of color-temperatures proposed by Janivier is as follows: Very dull red, 525°C.; dull red, 700°; bright red, 800°; cherry red, 900°; bright cherry red, 1,000°; very deep orange red, 1,050°; deep orange red, 1,100°; orange red, 1,200°; whitish, 1,300°; brilliant white, 1,409°; dazzling white, 1,500°; blue white, 1,600°. These data differ materially from those of White and Taylor, and Howe, who give temperature corresponding to white heat as 1,205° and 1,150°, respectively.

In designing an ore-crushing plant of 250-tons' capacity in 10 hours, it may be figured that a 10 by 20-in. Blake breaker and one set of 16 by 36-in. rolls will be sufficient. A breaker of that size will reduce to 1.7 in. size ordinary silicious ore at the rate of 25 tons per hour, while a set of 16 by 36-in. rolls at 35 rev. per min. will crush 600 cu. ft. per hour from 1.7 in. to 0.75 in. Assuming the material to weigh 85 lb. per cu. ft., which is moderate for silicious ore, the capacity will be 25.5 tons per hour. Instead of rolls 36 in. in diameter, however, some engineers advocate 40 in. diameter.

A recent bid for the iron-work of a 36 by 108 in. water-jacket lead-smelting furnace, together with a 10 by 7 in. rock-breaker, sampling rolls, rotary blower, engine and boilers, power transmitting machinery, and in fact the smelting plant complete, with the exception of foundations, buildings and erection, was $13,000 f.o.b. maker's works. The weight of the machinery and iron-work being 170,000 lb., this was an average of 7.65c. per lb. Another bid on the same equipment was $11,750, f.o.b. works, the total weight in this case beng 178,000 lb., giving an average of 6.6c. per pound.

Steam-shovel mining is distinctive of the Mesabi district of Minnesota, where it was introduced about 13 years ago. The usual rule is to mine by open cut, with the steam shovel, where the overburden is not more than 60 ft. thick. The force necessary for the operation of a steam shovel is: On shovel—one machine runner, at $4.25 per day; one craneman, $3.25; one fireman, $2.25; four pitmen, at $2 each; two trackmen, at $1.85. On locomotives—one engineer, $3; one fireman, $2.25; one brakeman, $1.75. Drilling and blasting—one head driller, $2.50; four drillers, at $2. On dump—one foreman, $2.25; five laborers, at $1.85. The steam shovel uses 2.5 to 3.5 tons of coal per 10 hours, at cost of $4 per ton. It works on a face about 25 ft. high, and loads 75 cars of ore, of 25 tons each, in 10 hours.

DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of THE ENGINEERING AND MINING JOURNAL.

THINGS THAT ARE MADE TO SELL AND TO USE.

The Editor:

Sir—The communication of Hiram W. Hixon, under the above head, in the JOURNAL of July 6, will strike a responsive chord in the breasts of many of your readers. Under certain conditions, where only an inferior cast iron can be obtained locally, as, for example, in parts of Mexico, one of the special steels, like manganese steel, may prove cheaper; but under other conditions, it is likely to be a waste of money to indulge in those fancy metals. However, this is something that the thoughtful millman soon finds out, and he cannot be fooled long.

The determination is not so easy with respect to machinery, because it is troublesome to keep a credit and debit for every machine in a mill, or even for the important ones, and few attempt it. There are not many more who attempt to reckon up roughly how things stand, unless some particular apparatus falls under suspicion.

In the case of ore-crushing rolls, for example, I used to think (when I was younger and less in the habit of analyzing the question if an idea were going to pay) that the only machine to use was one of the extra-high, superfine construction, that cost at the rate of, say, 15c. per lb. for the whole machine. Later on, I found that the medium-grade machines, made by certain experienced and reliable firms, which cost in the neighborhood of 7c. per lb., answered about as well, and were decidedly cheaper, taking into account the matter of first cost, and I concluded I had been paying too much for reputation, patent royalties, unnecessary special steels, etc.

Now, in the Joplin district of Missouri, they have been using for years the flimsiest-looking, rudest rolls that one is likely to come across in these days, which cost not much more than 3c. per lb., and they have been using them for hard service. I do not know how they would compare in duty, maintenance, etc., with the extra-high-grade rolls, because I have never seen them working under the same conditions. A couple of sets of the extra-high-grade would cost nearly as much as the whole Joplin mill. The cost of crushing at Joplin, however, is satisfactorily low, and it is my belief that the rolls they use there are the cheaper, not only in first cost, but also in operation. These rolls are coming into use to some extent out in the far West, and some of my friends who have used them there, and are in the habit of looking closely to the dollars and cents, have expressed to me their satisfaction.

It is far from my intention to belittle good machinery. In many cases it is absolutely necessary to have the best that can be built. Even in the matter of rolls, which I have used as an illustration, my own disposition is still toward the well-proved, medium grade; I should hesistate to try anything inferior, except in the Joplin district itself, where peculiar conditions exist. There is, nevertheless, such a thing as indulging in unnecessary refinements and using machines which are needlessly far ahead of their requirement, without figuring out how they will stand on the ledger.

P. W. C.

St. Louis, Mo., July 12, 1905.

PYRITE SMELTING.

The Editor:

Sir—Although the formal discussion in your columns of this very interesting subject has been closed, as I understand, to enable the publication in book form of what has gone before, one statement in particular in Mr. Channing's extremely valuable contribution in the JOURNAL of June 22 has inspired me to revert to the subject. It is indeed a discussion which must inevitably go on, inasmuch as it is impossible, as Mr. Channing remarks, ever to be able to say the last word on any technical subject, particularly in regard to metallurgical operations. It is now nearly 15 years since the JOURNAL ventured the editorial comment that "pyritic smelting is an iridescent dream," which provoked a discussion that was at its time as instructive as that recently run in your columns, although far less exhaustive.

In spite of all that has lately been written, I have been unable to arrive at a satisfactory definition of pyrite smelting, as distinguished from other processes in which the resultant product is a copper matte. When the JOURNAL said that pyritic smelting was an iridescent dream, pyritic smelting was understood to mean the concentration-smelting in the blast-furnace of raw pyrite without the aid of carbonaceous fuel, which was a precise definition. Smelting in that manner was at that time practiced at Tilt Cove, Newfoundland; but attempts elsewhere had failed, and the sole utilization of the pyrite as fuel appeared practicable only under special conditions. Since then the process has been successfully carried out at Mt. Lyell, but even there, as also in Tennessee, it is preferred to have a small proportion (2 to 3%) of coke in the charge, which Mr. Channing speaks of as a necessary evil to prevent crusts from adhering to the jackets.

There is certainly a distinction between what is called "pyrite smelting" and ordinary matte smelting, when, as in Tennessee, the same ore which formerly was roasted before smelting in the blast-furnace, is now charged in raw, notwithstanding a proportion of coke is used in each case. The behavior of the furnace is different, the character of the slag is different, and probably there is an important difference in the reactions taking place inside the furnace. On the other hand, a good deal of the smelting carried on at other places, which is called pyrite smelting, because the sulphide ore is added raw to the charge, differs in no essential way from ordinary matte smelting. The necessary iron oxide for slag formation is partially supplied in the form of naturally oxidized ore, and partially by the oxidation of the sulphide in the furnace, which takes place to a more or less extent in almost all forms of copper-smelting blast-furnaces. The sulphide is added raw, because after suffering the proportion of oxidation, that experience has determined under the particular conditions, the remaining sulphur will produce the desired matte-fall. The charge has previously been prepared with a view to making a slag of predetermined composition. The matte-concentrate performs the function of collecting agent for the gold and silver. This brings me to the statement of Mr. Channing's to which I originally referred.

He has found in Tennessee that with a given ore and a given furnace, the combination creates its own type of slag, from which it is impossible to make any radical change. In his case, the slag of the first smelting is found to run about 40% silica. The ore is a massive sulphide, which has to be fluxed with quartz. It makes no difference whether the proportion of quartz in the charge be increased or decreased; the slag will still remain at about 40% silica, and the only change will be an increase or decrease in the grade of the matte.

This indicates the distinct metallurgical difference between pyrite smelting and ordinary matte smelting. In the latter there is necessarily a reduction of ferric oxide to ferrous, and at a certain temperature a combination between the ferrous oxide and silica. In the former there is implied necessarily a direct decomposition of the iron sulphide by silica, because if there were oxidation of the iron in the upper zone of the furnace, its percentage would be more or less constant, a certain quantity of silica would be needed to flux it, and a change in the proportion of silica, instead of altering the grade of the matte, would alter the composition of the slag, producing a lower or a higher silicate, according to the temperature of the furnace, and under certain conditions tending to freeze up the furnace.

Assuming the direct decomposition of the iron sulphide, which has been argued and a hypothetical reaction for it written in the previous discussion of the subject in this JOURNAL, a freezing up would be impossible in the case of an iron sulphide and quartz charge, unless the concentration were carried so far as to produce a matte-fall too small to keep the bottom of the furnace properly hot, an evil which would more quickly become manifest in a small furnace than in a large one; or better it might be said, a higher concentration would be effected, because

of purely physical reasons, in a large furnace than in a small one.

The theory of direct decomposition of iron sulphide by quartz will gain strong support from the evidence of Mr. Channing (although he does not argue in its favor, confining himself simply to the statement of the fact), but it must have its limitations. We can hardly imagine the successful smelting of all kinds and conditions of copper-iron sulphide ores by merely regulating the silica in the charge. The experience as to the interfering effect of certain other elements, zinc for example, is amply sufficient to determine that point. It will, however, tend to establish better the rules of pyrite smelting by considering it from the standpoint of the theory of direct decomposition of the sulphide. C. T. B.

Denver, Colo., July 15, 1905.

Correspondence.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Letters should be addressed to the Editor.

We do not hold ourselves responsible for the opinions expressed by correspondents.

The Disaster at Guanajuato.

Sir—If you have not already received an authentic version of "The Terrible Disaster to Guanajuato," may I, through your courtesy, in behalf of the mining interests of this city, correct the reports which have appeared recently in the daily papers, throughout the United States and Mexico?

In order to better comprehend the situation, it should be explained, that the mines and their reduction plants, constituting the mining camp of Guanajuato, are not located within the limits of the city itself, but in the range of mountains rising above the same, and at elevations of from 300 to 1,500 ft. above the Guanajuato river, at a point where it flows through the center of the city. This naturally places the mines in their entirety beyond any possible encroachment of the river at any point.

Just so surely as history repeats itself, the heavy rain of Saturday, July 1, rushing down the course it rightly owned, through the city of Guanajuato, taxed its carrying capacity to the utmost; it naturally encountered those who in the building of their stores and houses had wantonly ignored previous high-water marks.

The consequent loss of lives (all of whom were identified with the *peon*, or lower class), due directly or indirectly to the high waters of the Guanajuato river, so far as is known at present, was nearly 100. The loss to property was entirely sustained by those who did not take the precaution to see that their buildings were too near the river's bed. Those who were located more than 100 ft. from its normal banks lost nothing. It would be impossible at this writing to give a correct value in loss of property, except to say that it can't exceed one-tenth the average of the amounts accredited by the newspapers.

Although the Mexican Central railroad was damaged somewhat, neither communication by mail or telegraph, nor transportation by freight or express has been interrupted a day. A few minutes delay each day is occasioned through repairs to the roadbed, which will be completed shortly.

From the headlines of some of the daily papers concerning our present condition, one might be led to believe that where Guanajuato once was, there now lie a tangled mass of railroad rails, adobes and "*muchas otra cosas.*" Knowing the situation as I do, I consider it a privilege, if nothing more, to try to right the wrong done, possibly unknowingly, to Guanajuato, by the daily press.

F. S. SHEWELL, Mining Engineer,
The Securities Corporation.

Guanajuato, Mexico, July 9, 1905.

Sir—Judging from inquiries received from the States "since the flood," it would seem that the impression has gotten out that this picturesque old town has been wiped off the map, and that the mines are, perhaps, flooded. Hence, a few facts that in the excitement of the moment escaped the first accounts published, may be of interest.

The cloudburst on the afternoon of July 1 caused no damage to the mines. One company had a portion of its surface tram washed loose. No foreigner, man, woman or child, nor Mexican of prominence, was lost. The chief loss of life (about 200) was caused by the crumbling of the adobe buildings, along the lower streets, entombing and drowning the occupants. About fifty houses fell, and about fifty more will have to come down. These buildings will be replaced by better ones. It is doubtful if the total property loss will reach $1,000,000, Mexican currency. Five or six American companies and individuals suffered comparatively small losses in their offices and homes. The event has tended to bring the Mexicans and Americans into closer relations. The mine managers (most of whom are Americans) brought their miners down into town in a body, and set them to clearing the streets, themselves assisting in the supervision. For this, and other energetic and timely service, the Mexicans, in general meeting, gave a standing vote of thanks to the American colony.

A tunnel (started after the heavy rain of 1873 to cut off the flood waters from the town) will now be completed. This will be some 1,200 m. in length by 25 sq. m. in section, and will have a capacity of 50 cu. m. per sec. The cost, in estimate furnished the Government a month ago, will be about $190,000, Mexican currency. A sewer system is also contemplated that will cost some $600,000. So one may say that, if Guanajuato cannot be exactly likened to Venus rising from the sea, she will at least come out the better for a good bath.

W. N. CUMMINGS.

Guanajuato, Mexico, July 13, 1905.

The Society of Chemical Industry.

BY CHARLES BASKERVILLE.

The twenty-third annual meeting of this British society, which in fact is now international, occurred at University College, London, July 10, It will be recalled that this society met last year in New York, and under the presidency of Sir William Ramsay (who gives himself to teaching and research). That was its first meeting on foreign soil. It seemed fit to select an American chemical manufacturer for the next presiding officer; and Dr. William H. Nichols, president of the General Chemical Co., was elected. Subsequent events have fully demonstrated the wisdom of the choice. It has been a source of great pride to the hundred visiting American chemists to feel the dignity and commanding ability of our representative (all of which is fully recognized by the English people). The shower of courtesies and attentions which have been heaped upon Dr. Nichols, could not but have been the cause of much satisfaction, both to him and to his countrymen.

The membership in the society now reaches 4,326. Of these, some 1,600 are in America. When the society was organized there were only 20 or 30 American members. Reference was made to this when President Nichols, for the New York section, presented to Dr. Edward Divers, the president-elect, an exquisite gold badge, designed by Tiffany, to be used as the insignia of the officer presiding on state occasions. This badge bears upon its face an excellent likeness of Sir Humphrey Davy, whose researches in the field of pure chemistry enriched and sustained the commercial, mining and agricultural interests of the world. Beneath the head are two hemispheres, the East and the West, joined together as emblematic of the apparent destiny of the English-speaking nations, namely, the maintenance of the peace of the world.

The postage of the journal of the society reaches the enormous sum of £850 a year. With the view of decreasing this expense an inquiry is being made as to the possibility of joint action with other learned societies whereby some reduction on the rates of postage of scientific journals may be obtained.

The Chancellor of the Exchequer of Great Britain last year appointed a departmental committee composed of Sir William Crookes, Dr. T. E. Thorpe and Thos. Tyrer to inquire into the existing facili-

ties for the use, without payment of duty, of spirits in arts and manufactures. As a result of the work of that committee the chancellor has announced his intention to propose legislation during this session of Parliament to carry out the recommendations of the committee. The activity of Thomas Tyrer, past president, in this work has been most fittingly appreciated in a dinner, given in his honor and attended by the leading men of applied science in all England. Obtaining alcohol for industrial purposes free from duty must come in our own country. It is to be hoped that the outcome of the efforts in England will encourage those urging the matter at home and will show the law-makers the right way, and at an early date.

Last year Sir William Ramsay, in his presidential address, dealt with the training of chemists, and gave the results of thirty years' experience. He left the subject at the graduation of the student from the College laboratory, and suggested that Dr. Nichols take it up where he laid it down. Perhaps no one in America is better qualified to deal with the subject, and a careful study of the splendid address of President Nichols will be more than worth while. Sir Henry E. Roscoe (the first president of the Society), in seconding the vote of thanks for the address, said, with much feeling, that it is "a wonderful and most valuable lesson from America, and we in the United Kingdom will take the lesson to heart; for, though we may not be able to carry out all the ideas of the organization described by the president, still we can, no doubt, adopt some of them and improve on our present methods."

Several pertinent excerpts may be taken from the address, but they fail to show the connection of the whole, which was closely knit.

In giving further reason for selecting his topic President Nichols said: "Being the result of many years of observation and work of one who started as a raw chemical graduate, with but a single laborer to help him, it may be of some value to others, even if it serve only to emphasize what to avoid. In any event, I know the plan outlined has answered fairly well for the management of large and extended chemical industrial enterprise, in a vast and rapidly growing country like the United States; it has stood the test of years in a company operating more than a score of plants, widely separated, and yet all working as a unit, controlled by the central governing body, but leaving the local managers sufficient freedom of action. While it possesses all the advantages of centralization, it is intended to extract from the individuals of the staff wherever located, the entire benefit of their ability and superior knowledge of local conditions. I do not put it forward as novel, for I do not know whether it be novel or not, such matters not being often discussed publicly. . . . In discussing the industrial future of the world we must take into account these new and enormous resources. The Americans did not create them. They might even feel humiliated that they have not accomplished more with them. The problems of the future for us are very great. If we were obliged to rely solely on natural increase of population, the unfolding would not be sufficiently rapid; but we are not. We can surely count upon a vast influx of immigrants, nearly a million a year, some of whom will be undesirable it is true, but most of whom will make useful citizens after they shall have learned the difference between liberty and license, and have become assimilated and Americanized. Indeed, it is our pride that many come to us qualified from the start to bear their part of the burdens, and to contribute their full share to the elevation of the country."

Time and again Dr. Nichols emphasized the fact that the success of any enterprise depends largely on the character and ability of its leading men.

In outlining the organization of a large chemical works, he said: "The detail work may be divided into the following general departments: Purchasing, sales, transportation, finance, construction, operating, research or investigation, and statistical; and yet all of these must be so closely interwoven and work in such harmony that best results shall be obtained without delay. To attain this object I have found it necessary to arrange two committees composed as follows: First, a manufacturing committee, consisting of the managers of the operating, construction, purchasing and investigation departments, the chairman being the chairman of the executive committee. This brings all departments having to do with the turning out of products, present and prospective, in regular and systematic touch with each other and with the executive committee. Second, a sales committee, composed of the managers of the sales, operating and purchasing departments, together with a member of the executive committee. This also results in a close touch of the department distributing products with the others, and with the active governing body."

Coming from the head of the greatest (in size) chemical company in the world, the following statement is of intense interest: "I have always believed that if your goods are well and economically produced—but not over-produced—at the right geographical points, their sale follows almost as a matter of course. I do not pin my faith very strongly to that method of doing business, by means of which manufacturers by agreement fix prices without much reference to cost, and thus court the competition which is sure to ensue. I believe that the best results in the long run are obtained by following natural laws willingly, rather than by combating them and inviting the disaster which is certain to follow the temporary benefit so derived."

Concerning the general qualifications of a works chemist, he said: "It is to be hoped that the courses in technical chemistry now given in some of our colleges may turn out men better prepared for the work than those who have entered the field hitherto. In the past I have not found it a matter of so much importance from which technical school a man has obtained his degree, as that he should be practical, reliable, hard working and possessed of natural ability, with the capacity for development and advancement, or, as Sir William puts it, 'to have the right attitude of mind.' As I have said before, the chemical education of the graduate can only be a foundation upon which the chemist who intends to become a manufacturer must build, by study, observation and experience; and, therefore, it is only the ambitious, self-reliant, able, practical-minded man who can expect to graduate from the laboratory into the wider field of works management, where the personal equation is so largely a determining factor."

The need of good common sense as well as technical training plays quite as important a part: "The chemist, to succeed in technical work, must strive for material results. It has been my experience that the post-graduate course seems to incline him toward the search of learning rather than to its application. He must have a clear, logical mind, a singleness of purpose, and he must be able to separate the essential from the non-essential. This is true of all professions, but it is particularly true in chemical work, where the essential must be selected from an unusually large assortment of non-essentials."

A very detailed account of the system and management of his company was given by the speaker. He said he could not see how such a company could be intelligently conducted without what he termed the "statistical department."

In concluding, he said: "All organization, whether in the chemical industry or any other, would fail to attain the best and most permanent results, if the personal equation be forgotten. We are not dealing with a collection of apparatus, but with an organization of men, every one an individual, with his own peculiarity and ambition. The day has not come, if it ever will, when a man will give his most efficient services, from purely altruistic motives. He must realize that, while his best work must be done, it will not go unnoticed and unrewarded. He must be sure that he will receive just and proportionately liberal treatment. His proper ambition must not be smothered, it must be directed. From an experience of many years, I believe the plan outlined above, provides fully for this most important fact, and I can point with the greatest

pleasure to many men as proof of my statement, and every one more enthusiastic than at the beginning. The places of the leaders will some day be vacant. Who then shall fill them? Those whose lives have been spent in preparation for the work, and who can enter into it without shock or derangement of existing conditions, but as naturally as the stream flows into the river. Thus will the natural ambition of the young man reach its fulfilment in due time and thus will our beloved industry progress to points of attainment which some of us may dream of, but will never see."

The form of entertainment which was offered the visitors abounded in costly elegance and cordial hospitality. The annual dinner, attended by the Lord Chief Justice of England and other prominent men, was held in the magnificent Goldsmiths Hall, where the display of plate was such as to dazzle those even accustomed to such marvels. The Royal Society, for the first time in its history, has opened its doors to another scientific organization.

As this goes to you, after a week of visits to institutions, plants, etc., in London, we are leaving for an extended trip, as guests of the Englishmen. We are to visit Nottingham, Manchester, Liverpool, York, Newcastle, Edinburgh and Glasgow. The good English brothers are giving us a double dose of entertainment; the accomplishment of all they have laid out for us will draw heavily upon our vaunted strenuosity.

At the hearing of a damage suit before a master in chancery at Butte, Mont., recently, it was testified that the extraction of mineral in the new Washoe dressing works is 80% of the content of the ore.

Four Diesel engines, of 150 to 180 h.p. each, operate the pumps at a Russian oil-pumping station. The cooling water is caused to transfer its heat to the oil in the pipe line. As there is so much oil, and comparatively so little water, there is no trouble in this arrangement.

For intermittent-pumping service it has been found more economical to utilize about a 15-h.p. gas or gasoline engine and do the requisite pumping in a comparatively short time, than to use a 5 or 8-h.p. engine and let it run all day. The saving in the attendant's time and the amount of work he can accomplish after shutting down the larger engine, more than offset the increased investment.

Three 7,500-h.p. Doble tangential water wheels have recently been installed for the California Gas and Electric Corporation, designed to operate at 400 r.p.m. under a head of 1,250 ft. Two 75-h.p. wheels for exciters in the plant of the Pike's Peak Hydro-Electric Railway Co. operate under a head of 2,100 feet.

The Anthracite Miners' Convention.

SPECIAL CORRESPONDENCE.

The annual convention of the Anthracite Miners' Division of the United Mine Workers opened on July 18 at Dunmore, near Scranton, Pa., and continued through the greater part of the week. The proceedings of the convention this year were of great importance to miners and operators alike, as indications of what the demands of the miners will be when the present agreement expires next April. Moreover, a good deal of light was thrown by the proceedings on the present condition of the Union in the anthracite country, its resources and the temper of the leaders. The dominating spirit in the convention was undoubtedly John Mitchell, the president of the Union. Mr. Mitchell was neither temperate nor conciliatory. He spoke, and seemed to feel, as a man who anticipated a long and stubborn contest, and all his eloquence and power of persuasion was directed to impress this fact on his audience of delegates from the miners of the region. It must be said, however, that Mr. Mitchell did not indulge in any denunciation of the operators. He said, in effect, that he did not want a strike, but as it was possible—indeed, probable—that a strike would come, the only way was to prepare for it with all the resources at their command. While there was nothing especially new in this, it evidently impressed his hearers.

It would be unfair to the leader of the Miners' Union not to take him at his word, for he is a man who invariably says what he means. He stated plainly that on April 1, 1906, the contract concluded under the direction of President Roosevelt the strike commission will expire, and the miners will then be in condition to demand their own terms. These will be as follows:

1. An eight-hour day.
2. The weighing of coal.
3. Uniform wages for company hands.
4. A definite, and as far as possible, a uniform scale for rock, slate, water and all dead work.
5. An agreement to be made directly between the anthracite operators and the United Mine Workers of America.

These demands, as stated by Mr. Mitchell, were formulated in the resolutions adopted by the convention at its close, with the addition of a resolution urging the adoption of a sensible and expeditious system of disposing of disputes.

As to the eight-hour day, the question can hardly be considered one of supreme importance. The fact is, that the miners themselves do not work eight hours. The mine laborers and the company men work nine hours, but as a rule they do not seriously object to present conditions. The most important question which will probably arise is the weighing of coal. The ordinary car of coal is paid for at the rate of a ton of 2,000 lb. The miners claim that the average car really contains from 2,500 to 2,800 lb. The operators, as a rule, admit some overweight, but say that, allowing for slate and bone, a car very seldom contains as much as 2,000 lb. of marketable coal, and very frequently a great deal less. No amount of docking can remedy the impurities in a car, or give an exact measure of the actual coal contents, and in the long-run the present system is quite as fair to the miners as to the operators. When the Anthracite Commission was in session a great deal of evidence was taken on this point, but no decision was given by the commission. It would be not only expensive, but impracticable, to weigh the coal at the breaker, owing to the very great delay which would be caused; and of course it would not be possible to weigh the coal after it passes into the breaker.

Related to this, is the question of check-weighmen and docking bosses, which came up for discussion in the convention. The check-weighmen question has been before the Conciliation Board, and was decided after a great deal of trouble; but that of the docking bosses still remains, and was, in fact, the cause of the recent strike at the Hillside Coal & Iron Co. Delegates from that Company's men, who were present at the convention, urged that it would not be possible to get a fair result unless a check-boss on the part of the men should be appointed at every colliery, with power to review the action of the company's docking boss. Manifestly, this would lead to endless disputes, and the convention was apparently well advised in expressing no decided opinion.

As to wages and the sliding-scale system, a statement presented for the twelve months ending with March, showed that in only two of those months was the price for mining the coal at the minimum rate. In October, November and December, when the price of coal at tidewater averaged about $4.85, the wage rate was 7% above the base rate. For two months it was 6% above; for two months, 5%, and for three months it was 3, 2 and 1%, respectively, above the base rate, so that the average wage for the year was nearly 4% higher than the basis.

The statement was made at the convention that the full strength of the Union in the anthracite country, as measured by its paid-up membership, is 289,006. As there are about 500,000 men and boys engaged in the industry, the actual number of Union men is a little over half. The mine workers, however, are really stronger than these figures would seem to indicate, for in case of a contest, the number would be increased by many men who are behind in payment of their dues, or who have otherwise dropped out for lack of interest, so that little or no reliance could be placed on these figures.

With regard to uniform wages for the company men, no valid reasons were presented at the convention, and the opera-

tors will hardly be willing to concede this point. The wages paid their men vary widely, as do their occupations. Thus the rockmen usually receive more than miners; while the work done by others is little more than common labor, and is paid accordingly. The positions are generally sought after, since the work is steady and involves less risk than most of the miners incur.

With regard to the Conciliation Board, there seemed to be a considerable difference of opinion. Some of the miners are opposed to it, while others rather favor its continuance. One great objection made to it was the slowness of the work; but in this sufficient allowance was not made for the fact that some of the cases before the Board were complicated and involved the taking of a great deal of testimony. The figures presented showed that in 1904 fourteen cases were submitted to the Board; eight of them by miners and six by operators. Of the miners' cases, three were decided in favor of the men and one against the complainants; while one case was not accepted as a proper subject for decision, four were withdrawn, and one is still under consideration. Of the operators' cases, three were decided for the complainants and three were withdrawn. So far as numbers go, the Board seems to have been impartial. The existing Board will expire with the present agreement, but the resolutions adopted by the miners indicate that, upon the whole, there is a demand for some arbitration board or tribunal of the kind.

Upon the whole, the temper of the convention was rather more moderate than had been expected. Nevertheless, it was evident that a peaceful outcome of the situation was hardly expected.

A New Continuous Steel Process.

S. Surzycki, in a paper read before the Iron and Steel Institute, May, 1905, described a new continuous steel process, which is based on the Talbot process, but can be carried out in any fixed furnace of not less than 25 tons capacity. It depends mainly on the arrangement of two of more tap holes, one above the other, but not in a vertical line, arranged in a cast-iron plate, lined with magnesite bricks and stamped dolomite; they give no trouble since they can neither slip, nor sink, nor be corroded. The tap holes lead into a double launder; when the molten bath has sunk to the lower hole, it is agitated by means of a rabble so as to clear the hole from metal. Some dry, burnt dolomite is thrown in on the charging side, the last drainings are removed from the hole and it is then closed from the tapping side. The whole operation lasts a few minutes only, the hearth remains sound for months, only the slagline and, in a less degree, the blocks needing repairs. The method is employed at the Czenstochowa works in Poland.

American Institute of Mining Engineers.

BY E. JACOBS.

The British Columbia meeting of the American Institute of Mining Engineers was held at Victoria, Vancouver Island, during the first week of the current month. The published itinerary was followed until after the Victoria meeting, when a change was made to admit of a day being spent in the city of Vancouver, which, although not the capital of the province, is the largest city in British Columbia. The party left New York on June 23; reached Spokane, Wash., on 26th; visited the Kootenay and Boundary districts of British Columbia on 27th, 28th and 29th, and arrived at Victoria, via Seattle, Wash., early in the morning of July 1.

W. F. Robertson, provincial mineralogist for British Columbia, met the visitors at Spokane, and accompanied them to the mining districts, and thence to Victoria. At Nelson, which was the first British Columbian point included in the itinerary, a reception committee, consisting of local members of the A. I. M. E., members of the Canadan Mining Institute and other prominent residents, cordially welcomed the party. An outing on Kootenay lake, going by steamer to Procter, where lunch was served at the Outlet Hotel, occupied the greater part of the day. Upon return to Nelson, a special train was in waiting to convey the party to Bonnington Falls, where the West Kootenay Power & Light Co.'s hydro-electric power station was visited and the plant inspected. The falls were viewed, after which the return run to Nelson was made, and two or three hours were spent sociably in the city, before leaving by rail for Rossland.

Next morning, at 9.45, Rossland was reached. Here the visitors were met by a committee similarly constituted to that at Nelson. One party was quickly made up to go underground at the Le Roi, Centre Star and War Eagle mines, through the main workings of which they were piloted by the respective superintendents and other officials of those mines. Some of the party descended to the lowest level of the Le Roi—a depth of 1,550 ft. A second party visited the concentrators at the Le Roi and Le Roi No. 2 mines; at the latter, the Elmore oil process, which has been used there to supplement water concentration, was explained by the installing engineer, H. H. Claudet. A third party was driven to several high elevations to view the surrounding mountain scenery and the valley of the Columbia river. Later, a special train took the visitors and others, to the number of about 150, down to Trail, where the copper and lead-smelting operations, and the silver and lead-refining processes, at the Canadian Smelting Works were explained by the superintendent, Jules Labarthe, and the making of lead pipe was witnessed. In the evening at Rossland the visitors were given a banquet; speeches were made, among others, by Dr. Raymond, secretary to the Institute; Capt. R. B. Hunt, of Chicago, a past president of the Institute; R. W. Brock, of the Canadian Geological Survey; Anthony J. McMillan, general manager of the Le Roi Mining Co., and A. A. Cole, secretary of the British Columbia Institute of Assayers. Rossland was left before midnight, and next morning the party arrived at Grand Forks, Boundary district.

The Granby's Co.'s general superintendent, A. B. W. Hodges, himself a member of the Institute, welcomed the visitors on arrival at the Company's smelter. The several departments of the works (sampling, smelting, copper converting, powerhouses, etc.) were visited in turn; after luncheon (in the mess-house) the train left for Phœnix, where the Granby Co.'s big ore quarries were seen. One of the long tunnels into the underground workings was entered; the steam shovel, powerful ore crushers, electrically-driven air compressors and other plant machinery were seen at work. At half past six o'clock the party returned to Spokane, via Grand Forks.

Notwithstanding that only a brief stop at Spokane had been arranged, prominent citizens met the excursionists on their arrival on Friday morning, June 30; Spokane Falls and other points of interest in the city were viewed, and luncheon was served at the railway station. A bountiful supply of fresh fruit and flowers added to the pleasure of the journey to Seattle.

Upon arrival at Seattle (which was reached before midnight), the Canadian Pacific Railway Co.'s new steamer, *Princess Victoria,* the finest of her class on the Pacific coast, was in waiting, with W. M. Brewer, secretary of the Victoria reception committee. Early next morning the party was landed at Victoria (the 80-mile run up Puget sound and across the Straits of San Juan de Fuca having been made during the night). The visitors settled down for a five days' stay in the capital of British Columbia.

At 3 o'clock, P. M., the business session was opened in the Ministers' room in Parliament buildings, the Government of British Columbia, having placed its own meeting room, situated near the legislative hall, at the disposal of the Institute for its meetings. W. F. Robertson, chairman of the local committee, briefly introduced His Honor the Lieutenant-Governor of British Columbia, Sir Henri Joly de Lotbiniere, who welcomed the visitors, and spoke briefly of the mineral resources of the province. The Hon. the Premier (Hon. Richard McBride, who is also provisional Minister of Mines) also extended a welcome; these meetings do much to foster and cement ties of

friendship between the United States and Canada.

Captain Hunt presided at the several business meetings, and acknowledged the kindly greetings offered.

Dr. Raymond, secretary, explained that the greater number of the papers on the program would not then be read, but would be circulated among the members when printed.

W. J. Sutton, of Victoria, delivered an address on the geology and mineral resources of Vancouver island. He traced its geological history, from the time when early volcanic activity prevailed, to a period of rest when sandstone shale was deposited, in the Upper Cretaceous period. Another time of volcanic activity came later, producing the building stone so well known. Later bituminous coal, as at Cumberland, was converted into semi-anthracite. In the later glacial period, an outlet was found by the Straits of San Juan de Fuca, in the south, and by the northern end of Vancouver island, in the north.

Thos. Kiddie gave some interesting information relative to the characteristics of the ore occurring in the Tyee Copper Co.'s mine at Mount Sicker, and its treatment at the smelter. He first read general analyses of the ore—raw and burnt—and of the slag made at the company's works, of which he is manager; these are given herewith:

Tyee Ore.—Copper (wet by elec.), 4.98%; silver, 2.07 oz. per ton; gold, 0.131; iron, 10.49%; zinc, 7.36; silica, 13.48; alumina, 7.01; barium sulphate, 37.63; lime, 2.04; magnesia, trace; sulphur (as sulphides), 15.15.

Burnt (screened) Ore.—Iron, 10.35%; silica, 10.96; barium sulphate, 41.50; lime, 1.94; zinc, 7.60; alumina, 4.93; magnesia, trace; sulphur (as sulphides), 6.32.

Slag.—Copper, 0.41%; gold, trace; silver, 0.14 oz. per ton; iron oxide, 17.25%; zinc oxide, 1.47; barium oxide, 28.57; calcium oxide; 6.00; silica, 31.42; alumina, 10.73; magnesia, trace.

Mr. Kiddie followed with an account of experiments with this ore in the blast-furnace, and explained the reduction of barium sulphate to sulphide. and its precipitation along with the copper and zinc in the matte; together with the manipulation of the charging and furnace practice in overcoming the reducing action of the coke and carbonaceous gases upon the barium sulphate; he explained that the barium in the slag existed entirely in the form of silicate, and not as sulphate as had been claimed; also that the zinc in the slag existed in the oxidized form and not as sulphide. He mentioned that he had quite recently installed at his Company's smelter at Ladysmith a hot-blast system; its operation is based upon the principle of long travel of the air at comparatively low temperature, as against the short travel at high temperature in the ordinary hot-blast stove; the waste heat from the blast-furnace is utilized in heating the air blast.

A. B. W. Hodges, general superintendent for the Granby Consolidated Mining, Smelting & Power Co., gave an account of the operation of mechanical furnace chargers at the Granby Company's smelter at Grand Forks, B. C. He mentioned some of the disadvantages of the first mechanical charger he had designed and used, though it had been a considerable improvement on hand-feeding. Next he explained the changes he had made this year, these consisting of two side-discharge ore cars run into the furnaces. Each car has four compartments so arranged that the charge can be placed in any part of the furnace desired, thus securing the distribution of the charge wherever needed. These cars are moved along tram tracks between ore and coke bins and furnaces by electric motors, and this charging system is operated so economically that a saving at the rate of $80,000 to $90,000 per annum, with six blast-furnaces running, is effected, this being the difference between the cost of hand-feeding and the new system of mechanical feeding. After Mr. Hodges had replied to the questions of several members, the business session was adjourned until the 5th instant.

Microstructure of Copper.

According to M. Giraud (in *Bull. Soc. d'Encour.*, 1905, 107) copper and cuprous oxide in the molten condition are mutually soluble, and on cooling give, when the copper is in excess, a mixture of a eutectic containing 3.5% of cuprous oxide, and the excess of copper. In mixtures containing an excess of cuprous oxide, however, especially if the solidification take place slowly, mixtures of the oxide and of copper without the eutectic, or of copper, cuprous oxide and the eutectic are frequently obtained instead of the expected mixture of cuprous oxide and eutectic. This apparent deviation from the laws of solidification of alloys is explained as follows: At the beginning of the solidification, crystals of cuprous oxide separate until the molten metal attains the composition of the eutectic, at which point copper also should begin to separate. The copper, however, remains in a state of superfusion, and the oxide alone continues to crystallize, the liquid becoming hypo-eutectoïd. When the superfusion ceases, copper is first deposited and then the eutectic. These phenomena are clearly indicated in the cooling curve, on which is a minimum corresponding to the superfusion, and a maximum corresponding to the crystallization of copper, followed by a step indicating the solidification of the eutectic. When solidification proceeds rapidly, the crystals of copper do not appear, the normal mixture of cuprous oxide and eutectic being obtained.

New Books.

The Elements of Geodetic Astronomy for Civil Engineers. By H. C. Lord, Professor of Astronomy at the Ohio State University. Comet Press, Columbus, Ohio, 1904. $1.50 net.

Mining Industry in North Carolina During 1903. Economic Paper No. 8 of the North Carolina Geological Survey. By Joseph Hyde Pratt. Pages, 74. E. M. Uzzell & Co., Raleigh, N. C., 1904.

The Official Proceedings of the Twelfth National Irrigation Congress, held at El Paso, Tex., Nov. 15-18, 1904. By order of the Executive Committee. Clarke & Courts, Galveston, Tex., 1905.

Report of Progress of Stream Measurements, for 1904. By M. R. Hall and John C. Hoyt (under the direction of F. H. Newell). Part IV. Santee, Savannah, Ogeechee and Altamaha rivers and Eastern Gulf of Mexico drainage. Pages 192, with many tables and index. Department of the Interior; United States Geological Survey, Washington, D. C., 1905.

Transactions of the American Institute of Mining Engineers. Vol. XXXV, 1904, New York City, 1905.

Contents: Wet methods of extracting copper at Rio Tinto, Spain, Chas. H. Jones. Notes upon preliminary tests and cyanide treatment of silver ores in Mexico by the MacArthur-Forrest process, John F. Allan. A bituminous-coal breaker, Lewis Stockett. Note on the relation between arsenic and electro-motive force in copper electrolysis, L. W. Wickes. Estimated costs of mining and coking, and relative commercial returns from operating in the Connellsville and Walston-Reynoldsville districts, Pennsylvania, E. V. d'Invilliers. Concrete in mining and metallurgical engineering, H. W. Edwards. Fuel and mineral briquetting, R. Schorr. The equipment of a laboratory for metallurgical chemistry in a technical school, C. H. White. A decade in American blast-furnace practice, F. L. Grammer. The use of high percentages of Mesabi iron ores in coke blast-furnace practice, W. A. Barrows, Jr. Note on the further discussion of the physics of cast iron, W. R. Webster. Notes on the physics of cast iron, Richard Moldenke. The standardization of specifications for iron and steel; recent progress in America and England, W. R. Webster and Edgar Marburg. Standard specifications for pig iron and iron products, a sub-committee of the American Society for testing materials. Chemical specifications for pig iron, E. S. Cook. Specifications for pig-iron and iron castings, Robert Job. Specifications for cast-iron and finished castings, Richard Moldenke. Standard specifications for cast-iron pipe, Walter Wood. Standard specifications for locomotive cylinders, Walter Wood. Standard specifications for

cast-iron car wheels, Charles B. Dudley. The need of standard specifications for gray-iron castings, Henry Souther. Notes on rail steel, R. W. Hunt. Direct-metal and cupola-metal iron castings, Thomas D. West. Notes and observations on cast iron, J. E. Johnson, Jr. The mobility of molecules of cast iron, A. E. Outerbridge, Jr. Stock distribution and its relation to the life of a blast-furnace lining, David Baker. The plotting of sizing tests, W. S. Hutchinson. The volcanic origin of oil, Eugene Coste. Geogenesis, and some of its bearings on economic geology, P. Frazer. Mineral deposits of Santiago, Cuba, H. Souder. Additional remarks on surveying instruments, H. D. Hoskold. Sulphide smelting at the National smelter of the Horseshoe Mining Co., Rapid City, S. D., C. H. Fulton and Theo. Knutzen. Origin of the magnetic iron ores of Iron county, Utah, E. P. Jennings. Report of a committee to co-operate in standardizing abbreviations, symbols, punctuation, etc., in technical papers. Appraisal of the value of mineral lands, with especial reference to coal lands. H. M. Chance. The commercial wet lead assay, H. A. Guess. Superficial blackening and discoloration of rocks, especially in desert regions, W. P. Blake. Alaska's mineral wealth, Alfred H. Brooks. Note on the cost and speed of sinking the east shaft of the New Kleinfontein Co., Benoni, South Africa, E. J. Way. Testing gold ores by amalgamation, E. A. Hersam. Biographical notice of Robert Henry Thurston, R. W. Raymond. Biographical notice of William Henry Pettee, R. W. Raymond. The genesis of the diamond, G. F. Williams. Centrifugal ventilators, R. V. Norris. The manufacture of coke in Peru, J. M. Clements. The geology of the Treadwell ore deposits, Douglas Island, Alaska, Arthur C. Spencer. The genesis of the copper deposits of Clifton-Morenci, Ariz., Waldemar Lindgren. Evidences of plication in the rocks of Cananea, Sonora, W. P. Blake. Improvements in the mechanical charging of the modern blast furnace, David Baker. Special forms of blast-furnace charging apparatus, T. F. Witherbee. Crushing in cyanide solution, as practiced in the Black Hills, South Dakota, Chas. H. Fulton. Cyanide practice at the Maitland properties, South Dakota, John Gross. Refractoriness of some American firebrick, R. F. Weber. The equipment of a laboratory for a smelting plant, Herbert Haas. Biographical notice of Sir Clement Le Neve Foster, T. A. Rickard. The concentration of gold and silver in iron bottoms, Myrick N. Bolles. Notes on the gold district of Canutillo, Chile, South America, Sydney H. Loram. Notes on the flow of gas from orifices, W. R. Crane. The fire clays of Missouri, H. A. Wheeler. The zinc-smelting industry of the Middle West, H. C. Meister. The application of dry-air blast to the manufacture of iron, James Gayley. The influence of carbon, phosphorous, manganese and sulphur on the tensile strength of open-hearth steel, H. H. Campbell. The decomposition and formation of zinc sulphate by heating and roasting, Prof. H. O. Hofman. The gold mines of the San Pedro district, Cerro Pedro, State of San Luis Potosi, Mexico, Geo. A. Laird. A geological cross-section of the western Cordillera along the Rio Huasco, Sydney H. Loram. The Taviche mining district near Ocotlan, State of Oaxaca, Mexico, H. M. Chance. The case of Henry Cort, Chas. H. Morgan. The coal fields of Missouri, B. F. Bush. Blast-furnace plant of the "Elba" Societa Anonima di Miniere è di Alti Forni, at Portoferraio, Elba, Carlo Massa. Roasting and magnetic separation of a blende-marcasite concentrate, Prof. H. O. Hofman and H. L. Norton. The effect of silver on the chlorination and bromination of gold, Prof. H. O. Hofman and M. C. Magnuson.

Transactions of the Institution of Mining and Metallurgy. Vol. XIII. Year 1903-1904. E. & F. N. Spon, Ltd., London and THE ENGINEERING AND MINING JOURNAL, New York.

Contents: The future gold production of Western Australia, H. C. Hoover. Treatment of telluride ores by dry crushing and roasting, W. E. Simpson. A system of handling sand mechanically for cyanide vats, Chas. Butters. Determination of tin in tailing and slime, G. L. Mackenzie. Cost of sinking the east shaft of the New Kleinfontein Co., E. J. Way. Amalgamation and other wet processes for silver ores in Mexico, H. F. Collins. On sampling the floor of a wet level, E. Levy. Geology of the Kolar gold field, A. M. Smith. On a tunnel under Lake Superior for supplying water to the Adventure stamp mill, P. R. Robert. Equipment of laboratories for advanced teaching and research in the mineral industries, Henry C. Jenkins. Causes and prevention of miners' phthisis, J. S. Haldane. First-aid treatment of acute cyanide poisoning, H. C. Jenkins. On the assay of tin, and on the solubility of cassiterite, J. H. Collins. Iron-ore mining in Scandinavia, W. F. Wilkinson. On the cribsetting of a deep-level shaft, Harry D. Griffiths. The diamond placers of the Vaal river, F. E. Coe. On a simple method for coloring photographs for technical purposes, Thomas R. Archbold. The microscope as an aid in copper refining, H. Nestor-Schnurmann. A graphic method of computation of blast-furnace charges, C. O. Bannister. The occurrence of platinum in wollastonite, on the island of Sumatra, Netherlands, East Indies, L. Hundeshagen. The dust in the air and the gases from explosives in a Cornish mine (Dolcoath) and the efficacy of methods of dealing with them, R. A. Thomas.

Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week ending July 18, 1905.

794,714. ORE-GRINDER.—Frederick J. Hoyt, Redlands, Cal.

794,752. APPARATUS FOR ALLAYING DUST IN CONNECTION WITH ROCK-DRILLING MACHINERY.—William C. Stephens, Camborne, England.

794,789. PROCESS OF MAKING CARBON TETRACHLORID.—Joseph L. Danziger, New York, N. Y., assignor to Castner Electrolytic Alkali Company, a corporation of Virginia.

794,799. ZINC-SMELTING FURNACE.—Edward C. Hegeler, Lasalle, Ill.

794,803. COAL-TIPPLE.—James Hughes, Glatto, W. Va., assignor of one-half to Robert C. Ashworth and one-half to Charles F. Thomas, Glatto, W. Va.

794,818. COAL-MINING MACHINE.—Clark J. Smith, Ottumwa, Iowa, assignor to Martin Hardsocg, Ottumwa, Iowa.

794,837. ROASTING-FURNACE.—Joseph A. Anker, James H. Watson and Pierce Evans, Los Angeles, Cal.; said Anker and Evans assignors to said Watson.

794,843. DRUM-MILL.—Richard Beneke, Bromberg, Germany.

794,853. AUTOMATIC FURNACE-FEEDER.—Henry G. Cox, Indianapolis, Ind.

794,858. SILVERING-TABLE.—George Glaudel, Crystal City, Mo.

794,867. MINING-LOCOMOTIVE.—Augustus H. Korsmeyer, Kansas City, Mo.

794,876. ORE OR ROCK CRUSHER.—Edgar S. Moulton, Central City, Colo.

794,928. ORE-CONCENTRATING TABLE.—Willis G. Dodd, San Francisco, Cal.

794,960. CHARGING-MACHINE FOR GAS-RETORTS.—Herbert J. Toogood, Elland, England, assignor to Robert Dempster & Sons, Limited, Elland, England.

794,970. PROCESS OF PURIFYING CARBON TETRACHLORID.—Joseph L. Danziger, New York, N. Y., assignor to Castner Electrolytic Alkali Company, a corporation of Virginia.

795,007. BRIQUETTING-MACHINE.—Grant W. Rigby, Pittsburg, Pa.

795,032. SLAG-FURNACE.—Oliver S. Garretson, Buffalo, N. Y., assignor to Garretson Furnace Company, Pittsburg, Pa., a corporation of West Virginia.

795,092. CONVERTER.—Ralph Baggaley, Pittsburg, Pa., and Edward W. Lindquist, Chicago, Ill.; said Lindquist assignor to said Baggaley.

795,133. GRINDING-MILL.—Milton S. Johnson, York, Pa.

795,139. BLAST-FURNACE.—Nelson M. Langdon, Mancelona, Mich.

795,148. METHOD OF TUNNELING.—James C. Meem, Brooklyn, N. Y., assignor of two-thirds to the Borough Construction Company, Brooklyn, N. Y.

795,161. GAS-GENERATOR.—Joshua J. Nix, Los Angeles, Cal.

795,163. APPARATUS FOR SETTLING SLAG.—Harold V. Pearce, Denver, Colo.

795,193. TREATMENT OF CHROMIFEROUS IRON.—Harry H. Campbell, Steelton, Pa.

795,218. FURNACE FOR TREATING SHEET IRON AND STEEL.—Harry H. Goodsell, Leechburg, Pa.

795,257. PROCESS OF GAS GENERATION.—Byron E. Eldred and Carleton Ellis, New York, N. Y., assignors to Eldred Process Company, New York, N. Y., a corporation of New York.

795,258. GAS-PRODUCER APPARATUS.—Carleton Ellis, New York, N. Y., assignor to Eldred Process Company, New York, N. Y., a corporation of New York.

795,259. REGENERATIVE GAS-FURNACE.—Carleton Ellis, New York, N. Y., assignor to Eldred Process Company, New York, N. Y., a corporation of New York.

Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Mr. F. H. Minard returned to Denver last week from California.

Mr. L. Humphrey is at present in Colorado on professional business.

Mr. Courtland E. Palmer, of the Guggenheim Exploration Co., is in Mexico.

Mr. John N. Judson is at South Strafford, Vermont, managing the Elizabeth mine.

Mr. W. T. Pipes has been appointed commissioner of works and mines of Nova Scotia.

Mr. Theodore T. Swift has removed from Safford, Ariz., to Mammoth, Pinal county, Arizona.

Mr. Lewis G. Rowand, of Denver, Colo., is visiting Mexico in connection with professional work.

Mr. P. G. Lidner has just returned to New York from a trip to Colombia on professional business.

Mr. Charles Ferry, metallurgist of the Bridgeport Brass Co., is spending his vacation in New Hampshire.

Ex-Secretary Lyman J. Gage has been visiting Boulder, Colo., where he is interested in some mining property.

Mr. Charles R. Keyes, president of the New Mexico School of Mines, at Socorro, was in Denver last week on his way South.

Mr. Frederick Grundy, of New York, has returned from Arizona, where he has been examining mining property near Tombstone.

Mr. G. C. Hewett, of Colorado Springs, Colo., is in New York on professional business, and expects to remain in the East for several weeks.

Mr. William Clark, formerly of Grass Valley, Cal., has been appointed superintendent of the Eagle & Blue Bell mine in the Tintic district, Utah.

Mr. H. C. Anchor has resigned his position as assistant superintendent of the Bully Hill copper mine in Shasta county, Cal., and has gone to Nevada.

Professors Knight and C. W. Dickson, of Queen's University, Kingston, have returned from a six weeks' prospecting tour in New Ontario, including the Cobalt region.

Mr. R. K. Humphrey has resigned as manager of the Montana Zinc Co., Walkerville, Mont., and will open an office for general engineering work at some other point.

Mr. Hallett R. Robbins, of Manchester, N. H., has started for Korea. He has been appointed mining engineer for the Oriental Consolidated Mining Co. in that country.

Prof. H. B. Dates, dean of the engineering school of the University of Colorado, has accepted a professorship of electrical engineering at the Case School of Applied Sciences.

Mr. Charles Fergie, recently appointed superintendent of mines of the Dominion Coal Co., has been made general manager of the company, his former office being abolished.

Mr. Robert Brown, of London, England, has been making a special examination of the fire-clay found in connection with the coal deposits around Pictou, Nova Scotia.

Mr. F. M. Clement, manager of the Sherbrooke Gas & Oil Co., of Sherbrooke, P. Q., has been visiting the oil wells at Sheguindale and near Manitowaning, Maintoulin Island.

Mr. D. T. Parker, formerly superintendent of the plant of the Ohio & Colorado Smelting & Refining Co., at Salida, Colo., is now superintendent of the Ponderay Smelting Co., at Sand Point, Idaho.

President James Ross, of the Dominion Coal Co., is making a thorough inspection of the company's mines at Sydney, N. S., and important changes in the management are anticipated as the result of his visit.

Mr. Foster Hewett, recently of Pittsburg, will act during the summer as assistant to J. E. Spurr, of the United States Geological Survey, in the examination of the Goldfield and Tonopah districts in Nevada.

Mr. H. B. Jewkes, late manager of the rail business of Hyde Bros. & Co., has severed his connection with that firm and has organized the Iron City Steel Co., with offices in the Bessemer building, Pittsburg.

Mr. James A. Creighton has been transferred from the Eagle & Blue Bell mine, of Tintic, to the Dalton & Lark mine, of Bingham, as superintendent. Both properties are operated by the Bingham Consolidated Company.

Prof. W. M. Davis, of Harvard University, sailed from New York, July 15, for England, to accompany the British Association to South Africa. The party will leave Southampton on July 29, and return in mid-October.

Mr. Howard W. DuBois, of Philadelphia, Pa., a mining engineer giving special attention to platinum and similar minerals, is making a visit to Cariboo, B. C., to investigate the prospects for the production of platinum in the district.

Mr. J. E. Hardman, of Montreal, is making some examinations in the new mineral district around Lake Abitibi, in Quebec, the discovery of which was announced last year by Mr. J. Obalski, inspector of mines for the Province.

Mr. Donald B. Gillies has resigned as manager of the Montana-Tonopah Mining Co., having associated himself with John McKane in the Schwab properties at Tonopah. He is succeeded at the Montana-Tonopah by Mr. John A. Kirby, of Salt Lake City.

Mr. Henry Hay, who has been engaged in mining work in the Transvaal and who is general manager of the Witwatersrand Deep, Ltd., at Johannesburg, is visiting his home in Los Angeles, Cal., on a well-earned holiday, after 10 years absence. He returns to the Transvaal in October.

Mr. C. A. Bohn has resigned his position as examining engineer in the mining department of the Torreon Metallurgical Co., to accept the general management of the mines and smelter of the Encinillas Mines, Ltd., at Santa Rosalia, Chihuahua, Mexico.

It is reported that Mr. T. J. Shaffer, president of the Amalgamated Association of Iron, Steel & Tin Workers, who will retire on October 1, has been tendered the secretaryship of the Independent Sheet & Tin Plate Manufacturers' Association, which is to be organized at a meeting to be held early in August.

Obituary.

William Jessop, who died in Bradfield, England, July 4, aged 48 years, was head of the old steel house of William Jessop & Sons, now an incorporated company, of Sheffield, England. The Jessop tool and crucible steel has been known for many years.

Thomas Tolley, who died in Leadville, Colo., July 18, aged 52 years, was born and brought up in Swansea, Wales. He had a thorough practical training in the smelting works there. He was one of the first to utilize the zinc ores of the Leadville district. In 1897 he put up a small mill in the district and prepared the zinc ore for shipment, the first sales having been made to Belgian smelters.

A correspondent informs us of the death by lightning-stroke of William J. Parker, Jr., of Cleveland, Ohio, a mining engineer, who had been for five years in the employ of the Whitney Co. at its mines near New London in North Carolina, and as electrician in the erection of the power plant. He was a man who had little to say, but was most proficient in his work. He was struck and instantly killed, July 21, while on his horse. He was about 35 years old.

William F. Patrick died at Rhyolite, Nev., July 15, after a three days' illness with pneumonia. Mr. Patrick was a prominent mine manager in the early days at Leadville and vicinity. He operated the Aftermath mine at Kokomo, and subsequently developed the Col. Sellers mine, adjoining the Minnie and Moyer properties in California Gulch, at Leadville. After retiring from the management of the Col. Sellers mine, he became interested in mining in various parts of the United States, recently in Nevada, in connection with his brother Lucien L.

Patrick. Mr. Patrick's home in Leadville was one of its social centers in the early days, and he will be well remembered by the pioneer operators at that town.

Edward W. Nash, president of the American Smelting & Refining Company, died at his home in Omaha, Nebraska, Saturday, July 22, from the effect of a stroke of paralysis which he suffered on May 22. Mr. Nash went to Omaha in 1867, and after a few years as freight handler in the Burlington Railroad station, entered the smelter at Omaha as a clerk. About 1883 he, with other capitalists, consolidated the Omaha Smelting Company with the Grant Smelting Company, of Denver, Colorado, under the title of the Omaha & Grant Smelting & Refining Company. In 1899, Mr. Nash being then treasurer of this company and president of the Velardeña Mining & Smelting Company, of Durango, Mexico, both these companies were merged into the American Smelting & Refining Company, and Mr. Nash was selected as president of the new company. He was also largely instrumental in the recent organization of the American Smelters' Securities Company, which assumed all the Guggenheim properties in Mexico and the United States.

Societies and Technical Schools.

Cape Breton Mining School.—The *Industrial Advocate,* of Halifax, N. S., says that, in conection with the closing proceedings of King's College, the executive committee of the alumni presented a report concerning the establishment of the college of engineering and mining in Cape Breton, which was adopted by a unanimous vote. Mr. Hiram Donkin made an encouraging address with respect to this school. He stated that there were 7,000 men within a radius of a few miles of Glace Bay, the average rate of wages was $3 per day, and some of the men earned as much as $150 per month. At Glace Bay he estimated there would be 200 constant students for the school of mining, and in the course of two years, if the school were continued with vigor, there would be 700 students.

Trade Catalogues.

Aetna Foundry & Machine Co., of Springfield, Ill., sends us its catalogue, "Hoisting Engines and Coal Mine Equipment."

The "Bargain Sheet" of the Gregory Electric Co., of Chicago, is worth reading, if in the market for second-hand machinery.

We have the catalogue of steam shovels made by the Atlantic Equipment Co., of 111 Broadway, New York. It is of standard size.

"Interurban Railway Construction" is the title of an artistic bulletin just issued by J. G. White & Co., 43 Exchange Place, New York.

The Cincinnati Milling Machine Co. has issued a "Treatise on Tool-Room Grinding" that is well illustrated and of standard size.

"Axial Valve Hammers" is the title of the Ingersoll-Sergeant Drill Co.'s (New York) new bulletin. It is of standard 6 by 9 in. size, and describes the tool its title indicates.

The Otis Elevator Co., 17 Battery Place, New York, sends us three "fliers" descriptive of dock and whip hoists and of hydraulic elevators, with a list of users of electric elevators.

"Jeffrey Screens" is the title of the latest bulletin by the Jeffrey Manufacturing Co., of Columbus, Ohio. It is 6 by 9 in., and shows sizing and revolving screens as built by the company.

Koerting Gas Engines are described and illustrated in a brochure of that title published by the De La Vergne Refrigerating Machine Co., New York. The descriptions and the tables accompanying will be of interest to all furnace men and users of producer gas.

The Stanley-G. I. Electric Manufacturing Co., of Pittsfield, Mass., hands us its bulletins No. 145 and 249. They relate to the type "L" D. C. motor, and type "Z" transformer and are of the standard 6 by 9 in. size.

A booklet of the standard 6 by 9 in. size, is issued by the Municipal Engineering & Contracting Co., of Chicago. While intended primarily for the use of their salesmen, the information given is of undoubted value to the engineer, and shows evidence of care in its selection.

The International Nickel Co., 43 Exchange Place, New York, states that the addition of 3% to 4% of nickel in steel increases the proportional elastic limit, adds to the ductility of the steel, increases its resistance to compression, abrasion and shock, and increases its toughness, so that, therefore, nickel steel is a safer material than carbon steel. A number of interesting pamphlets on this material are issued by the same company.

Industrial.

The Ajax Production Co., incorporated under the laws of Delaware, has been licensed to carry on the business of an oil company in Ontario, on a capital not exceeding $40,000.

The Pressed Steel Car Co. has received an order from the El Paso & Southwestern Railroad Co. for 500 steel coke cars of 100,000 lb. capacity. The special equipment includes Westinghouse air-brakes and Climax steel couplers.

The National Tube Co. has placed an order with the Youngstown Engineering Co. for electric cranes. The order includes four standard 10-ton and two special cranes of extraordinary size for transferring pipes from one mill to another.

The Duryea-White Machinery Co., of Los Angeles, Cal., is installing a new gasoline hoist for mining work. The main feature is the absence of all friction clutches, their place being taken by a special device, which is claimed to be giving good satisfaction.

The Fairbanks-Morse Canadian Manufacturing Co. has been incorporated under the laws of Ontario to manufacture tin, iron, steel, etc.; capital, $250,000; head office, Toronto; provisional directors, George W. Sparks, of Chicago, and Chas. J. Brittain and Arthur W. Holmstead, Toronto.

The S. H. Supply Co., Denver, Col., is furnishing two 8-drill compound air compressors with boilers, receivers, drills, etc., one going to Clear Creek county, Col., and one to Arizona. This company also reports sales recently of the Wild mill, which they are manufacturing, as follows: Two No. 2 mills to Idaho and one No. 2 mill and a No. 3 mill to Mexico.

At the Pencoyd Iron Works, Philadelphia, in the first half of June, 7,633 gross tons were charged in the 23-28 in. mill and rolled into beams, channels and angles. This is the best record in the history of the works. In 11 hours 396 tons of 6 by 6 in. angles were rolled; changed the mill in 1 hour and 10 minutes from rolling 12-in. channels to 6 by 6 in. angles.

The Geo. V. Cresson Co., manufacturer of power and crushing machinery, is furnishing the equipment for the complete installation of two copper reduction plants in Vermont, one with a capacity of 100 tons of material per day and the other capable of handling 200 tons. The same company is also furnishing the rolls for a 2,000-ton crushing plant at Little Falls, N. Y.

The Gröndal-Kjellin Co., Ltd., was chartered in London, England, recently with a capital of £100,000, for the purpose of exploiting the Gröndal process of concentrating and briquetting iron ores. The company also controls the Kjellin electric furnace, designed for the electrical production of steel. Naylor, Benzon & Co., London, are interested in the new company, and it is represented in the United States by Naylor & Co., New York.

The blast-furnace of the Northside Iron Co., Sharpsville, Pa., which was built several years ago for the purpose of smelting flue dust and which was operated for a short period, is now shut down and will probably be sold or leased. The furnace is 35 ft. high and has a bosh diameter of 7 ft. Owing to the large accumulations of flue dust in the Shenango valley at the various furnace plants, it was the intention to use the same instead of ore, some of the dust containing as high as 40% of iron. Little iron was

made, however, and the furnace after operating a short time was blown out.

A hydro-electric power plant is to be erected at Taylor's Falls, on the St. Croix river, 45 miles north of Minneapolis. It will contain eight Victor turbines of 4,200 h.p. each, operating at 277 revolutions per per minute under a head of 55 ft. The penstocks, which will be constructed of riveted steel, will have a mean diameter of 14 ft. The contract calls for the completion of four of the units by the end of the year, while the other four are to be in place early in 1906. The current will be transmitted to Minneapolis, where it will be used largely for lighting purposes.

The Abner Doble Co., engineers, of San Francisco, has recently secured the contract for the machinery to be installed in an addition to the hydro-electric plant of the Cramer Electric Co., successor to the Idaho Electric Supply Co., at Hailey, Idaho. This contract covers the entire water power and electrical apparatus, and includes a 400-kw. alternator directly driven by an 800-h.p. set of water wheels, exciter and governor; three-panel marble switch-board; two 25-light arc transformers and 50 arc lamps with regulators, switchboards and other accessories; 14 transformers and other supplies for the distribution system.

The Great Northern Power Co., Duluth, Minn., which is putting in a large hydro-electric plant, has just contracted with the Excelsior Wooden Pipe Co., San Francisco, for 1,200,000 ft. of redwood staves, 1,800,000 lb. of steel bands and 300,000 lb. of malleable iron shoes. The cost of the whole is approximately $200,000. The pipe company places the pipe ready for use. There are to be three of these stave pipes, each 7 ft. in diameter and 12,000 ft. long, extending from the company's forebay down the slope of the hill until a pressure of 164 lb. per square inch is attained. From this point to the powerhouse, where the head is 278 ft., steel pipe will be used.

Construction News.

Readers of the JOURNAL are requested to inform this Department of pending contracts, or of new work projected, giving name and address of the person in charge of the work or project.

Hodsons, Calaveras Co., California.—The Black Oak mine is to erect a new mill.

Joplin, Mo.—B. W. Lyon, of this city, and other interested parties intend to build a mill.

Torreon, Mex.—It is probable that the Torreon smelter will soon put up copper furnaces.

South McAlester, I. T.—The New State Steel Co. of this place will begin building at once.

Grant's Pass, Ore.—The Opp Mill will extend its plant at this place. Dr. Reddy is manager.

Lewiston, Montana.—The North Moccasin Mining Co. has let a contract for diamond-drill work amounting to $10,000.

Spokane, Wash.—It is reported here that a mill of 100 stamps is to be installed on the Eureka mine in the Slate creek country.

Yale, B. C.—The mill of the International Gold Mining Co. near this place is to be remodeled. Lew Stenger will have charge.

Santa Barbara, Mexico.—The Tecolotes Co., of this place, is reported to have made an appropriation of $300,000 for a new mill.

Panuco, Coahuila, Mex.—S. D. Bridge, of the Continental Copper Co., states that the company will begin the erection of a reduction plant here.

Torreon, Mexico.—It is reported that W. H. Ellis has made arrangements for building a plant at Monclova, Coahuila, for utilizing the iron ores of that camp.

Jarilla, N. M.—The South West Smelting & Refining Co. will erect large copper-reducing blast furnaces near this place. Its headquarters are at St. Joseph, Mo.

Tintic, Utah.—The Carisa mine is to be equipped with an electric power plant. An electric haulage system may be put in later. H. S. Joseph, of Salt Lake, is manager.

Tombstone, Arizona.—The Tombstone Consolidated Mines Co. is preparing to refit the old 30-stamp Girard mill by adding 20 stamps and a concentrating equipment.

Los Angeles, California.—The Mount Gaines Consolidated Mining Co., of Los Angeles, is about to instal another stamp mill on its property in Mariposa county, California.

Warren, Idaho.—The Thunder Mountain Gold Reef Co. has decided to instal a 30-ton mill at its property near this place, which will employ the cyanide and amalgamating process.

Clayton, Union County, N. M.—The Sater Copper Co., of Pittsburg, will enlarge the shaft on its new Mexico mine and install a hoist and pumping plant. W. H. Staley, Pittsburg, is secretary.

Bald Friar, Md.—The Conowingo Mining Co. expects to build a new mill for grinding spar on the J. C. Bell property at this place. The railroad company has agreed to build a siding to its site.

Prescott, Ariz.—George W. Middleton will have a 350-ton concentrator installed at Walker, Ariz., to handle the output of the Mudhole mine at the latter place and the Crook mine in Crook cañon.

Phoenix, Ariz.—The Sayer Gold Mining Co., which is composed of D. J. Sayer, of Denver, and J. E. Hubinger and E. L. Hearn, of New Haven, Conn., is planning a 20-stamp mill for the Leviathan property, near Martinez.

Duluth, Minn.—A 20-ton steel casting plant will be erected at the head of the lakes, in Duluth or Superior, and plans are being drawn up by the Northwestern Engineering Co., of Duluth. It is expected that building will be begun within three months.

Kimberly, Piute County, Utah.—Plans for a 150-ton cyanide mill to be erected by the Sevier Consolidated Co. are completed, and contracts for material and equipment will be let soon. R. W. Foster, of Kimberly, Utah, is manager.

Chamela, Jalisco, Mex.—There is talk of building a smelter here, as well as constructing an electric railroad from Guadalajara to the Pacific coast. D. P. Richardson is president of the Cacoma Mining & Smelting Co., and the railway is projected by the Jalisco Rapid Transit Co.

Alpha, Pa.—The Atlas Portland Cement Co., now operating the largest plant at Siegfried Pa., is preparing to erect another large cement plant at Alpha, Lehigh county. The Atlas Co. owns a large tract of land between the Vulcanite and the Alpha portland plants at that place, which contains deposits of cement rock.

Cornwall, N. Y.—It is reported that the Parrot mine on Warwick mountain and the Forest of Dean mine near the Wapwallopen pond back of Fort Montgomery, are to be re-opened and conducted on an extensive scale. Operations will begin in the construction of a gravity railroad. S. L. Mershon, of Montclair, N. J., is interested and says that operations are to be commenced at the Warwick mine as soon as the machinery can be put into place.

Helena, Montana.—A. W. Martin, secretary and treasurer of the Whitlatch Mining Co. states that they have purchased the machinery for a 20-stamp mill, and will run the machinery by electricity furnished by the Missouri River Power Co. He also states that excavating for the improvements will begin at once and the installation of the machinery will be pushed as rapidly as possible. The company will within the next five months spend at least $100,000 in improvement of the plant.

Aros River, Sonora, Mexico.—The Cananea Consolidated Copper Co., of Mexico, has secured a concession from the Government to erect hydraulic works on the Aros river. Construction must commence within two years from June 19, and must be completed within seven years from that date. The company may establish either an aerial or an underground system, and may also construct telegraph and telephone lines along the routes. Free importation of material, machinery and equipment is allowed for the initial instalment. A guarantee of $5,000 has been deposited by the company with the National Bank of Mexico.

Special Correspondence.

San Francisco. July 20.

In the Blue Ravine drift mining section, near Folsom, Sacramento county, Archie Gray and several others have for some time past been engaged in working over the tailing of the various mines, and recently they made an arrangement with the Sutter Mining Co. to wash the tailing of its mine. William Murray, from whom the Sutter company leases its ground, objected to the arrangement, contending that it was not in keeping with the agreement by which he let the company have the ground. He accordingly had an injunction served stopping the work of washing the tailing, and the matter will be settled in the courts.

The installation of the new dredger on Yreka creek, has caused quite a demand for dredging ground in Siskiyou county, where there are immense beds of auriferous gravel, most of them, however, being worked by hydraulic process. But now for dredging ground a large tract on McAdams and Indian creeks is under option to Oroville parties, who are soon to begin prospecting it. Some 500 acres south of Yreka, on Yreka and Greenhorn creeks, have been recently bonded, and preliminary prospecting has begun on these lands. Some 800 acres along the Klamath river are also bonded to the same company. Up in Plumas county the Nannie ranch in Mountain Meadows, near Quincy, consisting of 2,000 acres, has been bonded to dredge men and is about to be prospected with Keystone drills.

The sale of the Balakalala mine under the option held by the Bingham Consolidated people, to a syndicate headed by Clarence Mackay, is looked upon with great favor by the people of Shasta county, because it is now confidently expected that a large smelter will be erected at once.

The sale to Thomas McDonald of a half interest in the old Brown Bear mine at Deadwood, Trinity county, is also worthy of note, as it is an indication that the system of leasing in vogue for the past year will be given up and the mine worked by Mr. McDonald and the Watt heirs. The Brown Bear has not been worked by the company since the estates of the principal owners have been in probate. A few lessees have been employed and some of them have done well. The locally celebrated Watt tunnel, over a mile in length, was run to cut the orebody at a lower level, but it was stopped before the ledge was tapped, the suspension of work being due to the complications in ownership when the estates of the deceased proprietors got into court.

A new law of this State makes it a felony for any officer of a corporation to "assent to the publication, either generally or privately, to the stockholders or other persons dealing with such corporation or its stock, of any untrue or wilfully and fraudulently exaggerated report of stock values which is intended to reproduce or give to the shares of stock in such corporation a greater value or less apparent or market value than they really possess, or with the intention of defrauding the public or persons generally." Under this law State Mineralogist Aubury is about to make an effort to break up the methods of mining stock exchanges in conducting "wash" sales, which deceive the public as to the values of the stock.

Daniel Guggenheim, of New York, his son, Robert, S. W. Eccles, traffic manager of the American Smelting & Refining Co., H. B. Tooker, secretary of the American Securities Co., E. B. Braden, western representative of the Guggenheim Exploration Co., W. R. Rust, manager of the Tacoma smelter, and F. A. Newhouse, of New York, have this week been paying a visit to the Selby Smelting Co.'s plant, near Carquinez Straits, where they were received by Alfred von der Ropp, the superintendent, and shown through the plant. Plans are about to be decided upon for the enlargement of the Selby plant. It is expected that hereafter ores and concentrates from the Alaska quartz mines will be handled at the Selby works instead of at Tacoma.

The California & Nevada Ore Co. has contracted to erect a building in the south part of Oakdale, Stanislaus county, 60 by 100 ft., and will at once put in machinery for testing ores. A spur of the Sierra railway fronts the site of the proposed building. The location is between the pumping plant and the reservoir of the Oakdale Water Works. Electric power is available.

The old Majestic mine, in Rough and Ready district, Nevada county, has started up again after lying idle since 1899.

The Hasting quicksilver mine, about four miles from Benicia, Solano county, has been started up, and new furnaces and condensers are being built for treating the ore.

There is great demand for limestone deposits at present, and many known ones are being examined with a view to opening them. The so-called "lime trust" controls the best ones in the State, with the exception of those owned by the cement companies. A syndicate of retailers of San Francisco, who desire to escape from the exactions of the lime trust, have combined to manufacture lime in San Benito county, near where the Cienega Lime Co. operated on a large scale before it was stopped by the trust. These men have purchased the Harlan lime kilns at Cienega, and will immediately enlarge the capacity of the kilns, until the output reaches 1,000 bbl. a week. The syndicate has also purchased 160 acres of the Harlan land, upon which there are unlimited deposits of lime rock, and the necessary timber for fuel. The county has laid out a new road to the kilns.

Denver. July 19.

Preliminary arrangements being almost completed, work on the second large drainage tunnel in the Cripple Creek district will commence within a short time and A. C. Jacquith, the engineer, who constructed the first tunnel, expects to complete the work in about two years, the cost being estimated at $750,000. It will be about 3½ miles long from the El Paso shaft to the entrance.

The tungsten belt in Boulder county seems to be gradually extending and a number of locations of well-defined veins have been made lately, while a number of properties have changed hands.

In addition to the gift of $50,000 to the State School of Mines by Simon Guggenheim, he has given $25,000 more toward the construction of the administration building, for which bids ranging from $58,000 to $77,000 were received by the board of trustees a few days ago. The contract will probably be let at this week's meeting.

For many years past high-grade ore has been stolen from different mines in the Cripple Creek district, and a few days ago a raid was made on a number of suspected assay offices in the district, when a large amount of stolen ore was located; a number of assayers were arrested. The mine owners are determined to break up this so-called high-grading business.

James F. Burns, a large holder of stock in the Colorado Springs & Cripple Creek District Railway, generally called the "Short Line," has made a demand for the books of the company and his request has been complied with. Before the sale of the control of the road Burns was the largest individual stockholder and he still retains his interest; he has always been opposed to the sale of the controlling interest to the Colorado & Southern syndicate.

The Supreme Court has granted a writ of supersedeas in the case of the Gordon-Tiger Mining & Reduction Co., which involves property in the Twin Lakes district.

Recently discoveries of a fair quality of anthracite coal have been made in the vicinity of Steamboat Springs, in Routt county, which territory will be traversed and developed by the building of the Moffat road. During the past week the rumor has been current that the Colorado & Southern syndicate is negotiating for the purchase of that railroad.

The directors of the American Mining Congress are at present in session here, in order to discuss several questions of importance, the main one being the erection of a building to be their national headquarters. They are also considering the matter of having the organization entirely composed of and conducted by mining men. For the present the headquarters

are established in the Chamber of Commerce building of this city.

Scranton. July 22.

Alleging that they are not being paid standard wages, the 250 employees of the Hazle Mountain Coal Co., at Black Ridge, went out on strike on Tuesday. The strike is general among the employees. About a dozen men ignored the strike order until pickets were thrown around the works, when the deserters were induced to join the others. The company was not yet organized at the time of the settlement of the anthracite strike, and so did not come under the awards of the Commission, until recently it issued a notice saying that it would be governed by the awards, and that all differences with their employees would be settled by the conciliation board. Mr. Turk, who is superintending the plant, went to Philadelphia to confer with the officials of the company, who are expected to come to Hazleton and meet with the employees. The miners were only recently organized into a local, and have not been receiving union rates.

The fire which has been raging in the Nottingham mine for the past two weeks is about out. It has been entirely surrounded and all air currents cut off. Pipelines had been laid to the scene in case water was necessary, but fortunately it was not. The damage thus far has been slight.

The Pennsylvania Coal Co. is about to start operations in sinking another new slope to the Hillman vein on the east side of No. 14 breaker, Pittston, within a few days. This vein of coal is of excellent quality and is only a short distance from the surface, and has never been worked to any great extent in this country. In the early years the farmers used to mine some coal near the surface. With both of these slopes in operation, and another opening started at Plainsville, it is expected that it will give work to nearly 1,800 men and boys.

A safety device for mine cages has been patented by John G. Scott, of Girardville, and Eugene Lawson, of Wilkes-Barre. The device contains all the safety features of the cages now in use, such as dogs and fans; but in addition, it has an attachment which prevents the cage from ascending more than a certain distance above the landing. The patent of Messrs. Scott and Lawson detaches the rope from the cage before the latter reaches the sheave wheels in runways. There is no danger of loss of life, for as soon as the rope becomes detached the cage is caught in the fans, which are an improvement over those now in use. The mechanism that causes the detachment of the rope also puts the fans in operation. All the mine inspectors of the anthracite region have indorsed the device.

A peculiar strike originated at the Fernwood colliery of the Erie Coal Co. at Pittston on Monday. The employees of the mine are almost all Italians. They alleged that each pay envelope was short $11. They refused to return to work unless the money was paid. The officers of the mine promised the men that they would inquire into the matter, and that if a mistake was made it would be immediately rectified.

A force of men are engaged at Dobson No. 12 colliery, at Plymouth, installing a battery of new Maxim boilers. They are to be 500 h.p. and will generate more steam than any other boilers presently in use in the mines in the Plymouth district.

Another slight explosion of gas occurred at the Oxford mine on Tuesday morning. A miner walked into a pocket of gas with his naked lamp. He was severely burned in the explosion that followed. This is the second explosion that has occurred at this mine within a week.

More fire has been discovered in the west gangway of the Locust Gap mines, where more than a year ago a fire broke out which cost five lives and did an immense amount of damage. The fight to extinguish this fire and to recover the bodies has continued almost ever since. A curious circumstance in connection with this fire is the fact that it resulted in the discovery of four veins, the presence of which was not suspected. The discovery was made while boring holes in which to pour down slush to put out the fire.

A new gangway has been started in the sub-slope of the Silverbrook mines at Pottsville. This will considerably increase the output of the colliery.

Calumet. July 22.

Grading for the extension of the spur track of the Mineral Range railroad to C shaft of the Mass Consolidated mine in Ontonagon county is rapidly nearing completion. The spur is up hill all the way, but only empty cars will have to be hauled up the grade. Excavating for the foundation of the new shaft-house and rock-house at C shaft is completed. The structure will not be started, however, until the railroad extension is completed, as the material will be brought in by rail.

Work in the Kearsarge shafts of the Calumet & Hecla Mining Co. is progressing steadily. No. 19, the northernmost opening on the property, makes a fairly good showing, and the same is true of No. 20, next south. No. 21 shaft, which is located on the extreme southeastern corner of the Calumet & Hecla's main property, is unsatisfactory. No. 20 shaft is shipping rock to the stamp mill. These shipments are not regular, but are made as rock accumulates from opening work.

Wolverine is making copper at the rate of 9,600,000 lb. per annum. The output of the mine shows very little change from month to month. The equipment of the property is probably complete for all time, and, with the exception of renewals and repairs, the construction account will be practically blank.

Leadville. July 21.

In the past 26 years Carbonate hill has produced a heavy tonnage with values reaching up to many millions of dollars, and still the large bodies of ore are a long way from being exhausted. A large force of men is employed in different mines and the hill is one of the most active centers in the camp. From the Castle View shaft of the Big Chief Co. in the neighborhood of 175 tons daily is being shipped, consisting of sulphides and oxidized iron; development work is being kept well ahead and there is enough ore blocked out to keep the present tonnage up for the next three years. The Wolftone, east of the Castle View, has an immense body of ore blocked out, but on account of the inability of the smelters to take the ore, iron and zinc sulphides, the mine for the time being is closed, all that is being done is pumping water. The Morning and Evening Stars are being worked by lessees, who are shipping 300 tons of a very good grade of iron. The Yankee Doodle is shipping 300 tons of iron monthly, and the Evelyn shaft is getting ready to ship. In addition to this work a number of prospects are being worked, and before long two or three of them will be in ore.

For a number of years mining in a primitive manner has been carried on at the head of Lake creek, Eagle county, and some good material has been found on the surface. John E. Miller, of Leadville, is the owner of 18 claims, which he has bonded and leased to an Eastern company, which is now doing some extensive work. As most of the claims are above timber-line, the first work to be done by the company was the starting of an adit at the foot of the hill, and which will be driven 1,200 ft., and when this point is reached the depth from the surface will be 1,200 ft., and the veins will be cut. Air compressors and machinery have been placed on the property and the work is being pushed. The Boileau system of treating ore will be placed on the dump and all of the low-grade ore worked by this process. The vein on which the most work has been done is 4 ft. wide and in this matter is a streak about 3 in. wide that runs high in gold; the whole of the 4 ft. will average well. The property is 20 miles from a railroad and everything has to be hauled by wagon and then packed for several miles, which makes mining very expensive.

The properties on Dyer mountain are located above timber-line and mining is carried on under difficulties. This will, in a measure, be overcome by the strike recently made in the Greater New York,

as a wagon road is now in course of construction from the head of Iowa gulch to the mine. The tunnel on the property has been driven in 300 ft., and at the breast a body of ore 4 ft. wide has been opened, carrying good values in gold, silver, lead and copper. Dyer mountain is at the head of Iowa gulch, and joins on to Mosquito range.

Three properties in the Sugar Loaf district are making records for themselves as to the amount of ore shipped and the values. The Tiger is sending out regularly a good tonnage of sulphides and the Gunnison is shipping high-grade stuff from the recent strike.

The Buffalo-President shaft, on the south side of Rock hill, is installing new machinery and placing pumps in the shaft to handle the water struck at a depth of 350 ft. Sinking will be resumed by the end of the week.

A station is being cut at the bottom of the Penrose shaft where a compound pump will be installed. When this one is placed the station will be continued for 60 ft. and will be 14 by 16 ft. in the clear, when the other two will be put in; this will settle the water question, as three pumps will be able to raise 3,000 gal. of water per minute. When the station is completed, drifting will be started toward the Penrose.

Butte. July 18.

The Goldsmith, a gold and silver producer, located in the northern part of the Butte district, will change ownership next week, passing from the estate of George H. Tong to Charles W. Ellingwood for $50,000. The deed has been signed by all the heirs save two, who are not in Butte at present. Mr. Ellingwood has been working the property under a lease and bond about three years and has paid the estate $122,000 in royalties. When he took hold of it, the estate was indebted to the State Savings Bank $68,000, which was secured by a mortgage on the Goldsmith and other mine interests owned by the estate. This sum has been paid from the royalties. Some rich ore has been taken from the mine since Ellingwood took hold of it. A third of the mineral value of the ore is gold.

United Copper is shipping a portion of its waste dump at the Belmont. It carries between 1 and 2% copper, but is fine and will concentrate. The report of a strike of rich ore in the mine is untrue. The work of development is progressing, however, and may result in the discovery of pay ore.

The smelter of the Pittsburg & Montana Co. was started last week, but after a run of three days it was closed again to permit of some changes in the furnace spouts. Work was resumed in the plant Monday and will probably continue several days. The mine work has not advanced sufficiently to permit continuous operation, although the bins contain several thousand tons of ore and stoping in one of the veins is in progress. The smelter has a capacity of 300 tons per day, but if the process in use proves successful, an increase will be made. Ralph Baggaley, who invented the process, says he is certain of success, having fully demonstrated its practicability. Mr. Beardsley, formerly in charge of the smelting plant of the Mount Lyell Co. in Tasmania, is engineering the preliminary work

Boston & Montana is building two precipitating towers, preparatory to abandoning its old plant near the Leonard mine. Many tons of copper are saved annually by the company in this way. The water from the mines will flow directly into the new towers.

The Reins Copper is adding another pump to the one on the 800-ft. station of its mine and making a raise from the 800 to the surface to afford an avenue of escape in case of accident. The new pump will throw 700 gal. of water per minute 800 ft. As soon as it is installed sinking will be commenced and the shaft sent to the 1,200-ft. level.

Elling & Morris are shipping ore from the Boss Tweed and Clipper mines in Madison county. The first-class goes to Helena and the second to a mill they have leased near the mine. This property is a gold producer, and was worked on an extensive scale by the Indian Co., the owner, three years ago. It is under lease to the present operators.

The North Butte, Amalgamated and Original companies are maintaining a steady output of copper-silver ore from their mines, the first raising between 700 and 800 tons per day, the Amalgamated 10,000 and the Original about 1,000. The Raven is extracting copper ore from its Raven and Snoozer. The Montana Zinc will be ready to resume work in its mill the latter part of this week. During the suspension, which has covered a period of a month, extensive repairs and improvements have been made in the plant.

Salt Lake City. July 22.

According to the June report of the superintendent of the Paymaster mine, near St. George, Washington county, the main shaft has been sunk 75 ft. below the old workings. Recent developments will justify the starting of the small matting furnace built a few months ago.

The Bingham Consolidated smelter, near Salt Lake, is now turning out from 50,000 to 60,000 lb. of copper bullion per day. A third converter is about ready.

Reports of new finds near Bullion, Lander county, Nev., have attracted a number of Salt Lake mining men to that section.

Developments at the Uncle Sam Consolidated during the week have revealed an ore-bearing channel on the 500-ft. level. The ledge was opened on the upper levels, and a large tonnage was taken out.

At the Lower Mammoth mine, in Tintic, development work prosecuted on the 1,400-ft. level has been productive of important results.

The United States Mining Co. has won another point in the litigation that has been pending for some time over the possession of the Kempton lode mining claim in Bingham, which is estimated to have a value of $1,500,000. Col. E. A. Wall, of Salt Lake, and others are defendants. In the lower court the latter won. The case was then carried to the Circuit Court of Appeals at St. Louis, where the judgment was reversed. Application was then made by Wall and associates for an appeal to the United States Supreme Court, this being denied by Justice McKenna, to whom the matter was submitted. The next and final move will be to get the case before all members of the Supreme Court on a writ of certiorari.

The mine and mill of the Overland Gold Mining Co. at Sunshine, sold at a receiver's sale recently, are to be operated again. The mill is being overhauled and will likely go into commission next week. E. W. Clark, of Ophir, Utah, is manager of the property. M. W. Sheets, of Sunshine, is mill superintendent.

The Ohio Copper Co., of Bingham, has commenced the development of the What Cheer ledge by a crosscut from the All's Well ledge.

The American Smelting & Refining Co. has about concluded negotiations for the purchase of all the ground it requires in the western portion of Salt Lake county and near the old Garfield beach resort, for the proposed 2,000-ton copper smelting plant. It is expected that all matters of title will be cleared up within the next 10 days, and that the breaking of ground will commence during the month of August. Daniel Guggenheim, chairman of the executive committee, stated in Salt Lake to-day that the big plant would be ready for commission early in 1906.

Negotiations are said to be pending for the purchase of the old Dyer copper mine, near Vernal, by Jesse Knight, of Provo, Utah. The property has produced $500,000 worth of copper bullion and is equipped with a small smelting plant.

Not a little interest is being manifested in Salt Lake over the opening of the Uintah Indian reservation, which is expected to occur during the coming fall; which will open to the prospector what is believed to be a good mineral region.

Owing to a serious cave-in, the Bingham-New Haven shipments have been temporarily suspended. Work will commence next week on the construction of an aerial tramway which will connect the mine with the trading station on the Copper Belt railroad. The tram will be in operation in sixty days.

Indianapolis. July 24.

According to the twenty-ninth annual report of W. S. Blatchley, State Geologist of Indiana, just issued, the value of the products of the six leading natural resources of a mineral character, has increased 115% in the last 10 years. The resources named are coal, petroleum, natural gas, building stone, clay products and portland cement; the income from these products has increased from $16,770,816 in 1895 to $36,028,755 in 1904.

As might be supposed, the largest increase has been in petroleum products, from $2,807,124 to $12,176,880. The income from coal increased from $3,923,996 to $10,366,024; building stone, from $1,718,520 to $3,031,925; clay products from $3,117,520 to $6,085,424; portland cement from no income in 1895 to one of $1,241,396, in 1905. The only one to show a decrease was the income from natural gas, which decreased from $5,203,200 to $3,027,106.

Mr. Blatchley's report says, that when the value of these six named resources are increased by those of the hydraulic cement, lime, whetstones and grindstones, sand and lime brick, artificial stone, molding and glass sands, and other minor natural resources, the total will foot up $40,000,000 or more.

In addition to this general summary, the report contains a thorough discussion of the clays and clay industries in Indiana, "A dozen years ago the term 'shale' was unknown among the natural resources of the State. These great beds of soft, blue-gray, thin-layered rock occur over vast areas in the coal-bearing counties; they were looked upon as valueless and a nuisance, as they had to be cut through before underlying beds of coal could be reached. Today the smoke is pouring forth from hundreds of kilns where shale is being burned into sewer pipe, hollow block, conduits, paving brick, pressed brick, drain tile. . . . The Indiana clay industry last year gave employment to 7,343 men, with total capital invested of $6,519,403 and the value of the output was $6,085,493, almost equal to the capital."

Platteville, Wis. July 22.

The mining interests in the region of Hazel Green will receive quite an impetus this fall, owing to the fact that the Chicago & Northwestern Railroad will extend the road so as to reach the Hazel Green and Jefferson mining companies property, located in Grant county, near the village of Hazel Green. This new road will put these properties in a position to run constantly. Heretofore they were hampered more or less by bad roads, being unable to get fuel to the mines at all during the wet season. The Hazel Green Mining Co. is now putting in a magnetic separating and roasting plant to treat the low-grade ore, which has been put aside while the higher grade was milled. There is also several hundred tons in the bins, held to treat in the new separating plant. It is expected to have the separating plant finished about the same time as the railroad gets there. The Hazel Green mine is a rich property, and is controlled by local capital. There are three shafts, averaging only 110 ft. in depth. The formation comes nearer to a true fissure than anything else in the Platteville district. Ore was first discovered in paying quantities about 30 ft. from the surface. The crevice runs from 10 to 40 ft. wide, and is filled with ore. Some lead also is found with the zinc. The company has recently installed two 100-h.p. boilers, an 18 by 42-in. Corliss engine, generators and compressor. An advantage enjoyed by the company is the fact that the officers all live in the district.

The Skene mine, situated on the edge of what is known locally as the Platteville zinc and lead district, is the largest lead producer in the district. Previous to July 1 it was operated in the old-time way and produced from 10 to 15 tons per shift of 10 hours. The property has recently come under the control of C. E. Everett, of Chicago, under whose management a complete equipment of modern machinery is being installed for pumping, hoisting and concentrating. Formerly the chunk ore was prepared for the market by sorting out after blasting, and hauling to the car. With the machinery that is being installed all ores that come from the mine can be treated. Considerable attention is to be paid to that portion of the slime wherein values have been lost. In addition to the usual installation of crusher, rolls and jigs, it is the intention of Mr. Everett to make use of the Overstrom table, thereby saving the values in the slime. As soon as the new concentrating plant is installed, the company will be in shape to ship 30 or 40 tons or ore per day.

Sudbury. July 17.

Some interesting litigation will arise over the announcement by the Attorney-General to set aside several mining leases issued to parties in the Timiskaming mining district. One of the largest claims in the district is involved, and several parties' rights are sought to be set aside.

The Department of Lands and Mines has, by a commission to a barister of St. Thomas, named Samuel Price, appointed the latter to investigate and adjudicate upon several matters in dispute in the new mining districts. From the standpoint of economy the idea is a good one, as it will admit of matters in dispute being settled in the district in which disputes arise, thus avoiding the delay and inconvenience, not to speak of the intolerable expense attached to the removal and conveyance of witnesses hundreds of miles.

Captain Travers, late of the Elsie and Gertrude nickel mines, is now in charge of the Creighton mine for the Canadian Copper Company.

The Shakespeare gold mine is still continuing active operations, and the brick turned out during the month of June netted $4,200. The present plant seems to be inadequate and a new plant is contemplated so that the output may be considerably increased.

Six of the townships withdrawn from the market by the Government in 1901 have again been re-opened for settlement and mining purposes. The townships are Levack, Baldwin, Hyman, Trill, Cascadden and Drury. There were several large nickel finds made and registered on the above-named townships prior to their withdrawal, and a renewal of activity may be looked for.

The Ontario Bureau of Mines contemplates carrying on an active and systematic exploration during the present season in this part of New Ontario. Five different parties under the direction of capable men will go out.

The switch of the Algoma Central railroad into the Breitung mine is now being ballasted; operations there are expected to begin immediately on the completion of the switch.

The rather sensational dispatch received in Toronto last week regarding the extensive forest fires in the Temagami district was altogether misleading. Prospectors and tourists are simply flocking into the district.

Toronto. July 15.

The Attorney General's department of Ontario has issued writs against Michael J. O'Brien, of Renfrew; James B. O'Brien, of Toronto; W. C. Chambers, Arthur Ferland and Thomas Herbert, of Nipissing; Ellis P. Earle, New York; W. B. Russell, formerly chief engineer of the Timiskaming & Northern Ontario Railway and the Nipissing Mining Co. These parties are owners of mining locations in the township of Coleman, where the cobalt mines are situated and the actions are brought to declare the leases under which they hold void, as having been granted by mistake and fraud. It is charged that the defendants filed claims covering large sections without having made any actual discoveries of minerals. The law requires that before a prospector can make a claim to a mining location he must produce evidence of the discovery of minerals. The leases were issued in February last under the Ross administration.

The Beaver Mica & Mining Co., Ltd., has been incorporated, with head office at Sundridge, Ont., capital, $50,000; provisional directors, Joseph Pinkerton, Jonas Herrgott, John J. Jackson and James H. McCurry.

Victoria, B. C. July 17.

Cariboo.—A partial clean-up at the Consolidated Cariboo Hydraulic Mining Co.'s big hydraulic mine at Bullion, Quesnal Forks, has been made after three or four weeks' washing. The result is stated to have been a recovery of gold valued at about $25,000. The work of driving the 1,200-ft. sluice tunnel, of which 650 ft. were driven last season, is being vigorously proceeded with, and its completion in time for use this season is intended. The dimensions of this tunnel are 10 by 10 ft. in the clear—large enough for a sluice 7 ft. wide by 3 ft. deep, and a walk 2 ft. 6 in. at one side for the sluice tenders.

Nicola.—Prospecting the coal measures on the Diamond Vale Coal Co.'s property at Quilchena is being actively carried out. A third diamond-drill hole is being bored, and when this shall have been completed a fourth bore will be made. This drilling is being done with the object of determining the best available place for a main entry for the mine. W. H. Wall, mining engineer in charge, is quoted as stating that there is an aggregate of about 60 ft. of coal in workable thicknesses on the company's property.

Nelson.—The Hall Mining & Smelting Co. has leased the B. C. Standard Mining Co.'s Hunter V. mine, in the Ymir district. The lime-silver ore occurring on the Hunter V., Standard and other claims of the group makes an excellent flux for lead smelting, and as transportation costs between the mine and the Hall Co.'s smelter at Nelson are not high, the ore can be used to advantage at these works. The B. C. Standard Co. for a time made good profits, but its later operations have not been remunerative, more expensive mining having been necessary, the difficulties attending working in open quarries at a high altitude where the snowfall is heavy having added considerably to the cost of getting out the ore. The management hopes to obtain capital for needed development work; meanwhile the property will be worked under lease by the Hall Company.

Boundary.—In connection with the taking over of the properties of the Montreal & Boston Consolidated Mining & Smelting Co. by the Dominion Copper Co., it is announced that an agreement between these companies and the National Trust Co., of Toronto, Ontario, Canada, has been executed, the signatories being (1) the directors of the Montreal & Boston Co., (2) D. D. Mann, president, and W. H. Moore, secretary, of the Dominion Co., and (3) Z. A. Lash, president, and W. T. White, secretary, of the Trust Co. A statement issued by the Montreal & Boston directors showed that their company owed about $320,000 and was unable to obtain the money necessary for the discharge of these liabilities and for further development of mines and additional equipment of smelter requisite to provide for a larger production and treatment of ore. About $186,000 of the liabilities were due to the Dominion Copper Co. for instalments on account of mines purchased from that company and royalties on ore extracted therefrom; some $90,000 were owing to two trustees for money advanced after the Munroe & Munroe failure last winter, when an effort was being made to sell sufficient stock to relieve the company of financial embarrassment; and there were beside miscellaneous liabilities estimated at about $43,000. The Montreal & Boston Co. held nearly 1,243,000 shares of its own stock, and these the Dominion Copper Co. takes over and agrees to assume the debts of the Montreal & Boston and float a bond issue of $1,000,000 to provide the capital necessary to pay the liabilities mentioned and provide for required development and equipment. Of the bond issue, $700,000 are to be placed now—an underwriting syndicate having guaranteed subscription of amount not taken by the stockholders —and $300,000 held for later issue when needed. Samuel Newhouse, of Salt Lake City and New York, is to be managing director of the new concern, with T. R. Drummond as resident manager, and W. C. Thompson as smelter superintendent, the last-named officials having been connected with the Newhouse interests in Utah.

Coast.—The Tyee Copper Co.'s smelter at Ladysmith, Vancouver Island, during 13 days in June treated 1,988 tons of ore from the Tyee mine, Mt. Sicker, from which was obtained a return, after the deduction of frieght and refining charges, of $30,950.

A promising find of gold-copper ore is reported to have been made recently in the Cowichan district, Vancouver Island.

London. July 15.

It is pleasant to be able to record that the Mond Nickel Co. has got over all its many troubles, and is now on a highly satisfactory basis, with prospects of many years of prosperity. The Mond process for separating nickel from copper by making use of the volatile compound with carbonic oxide is a most ingenious and interesting one, but far from easy to adapt to commercial requirements. In fact it has taken practically 10 years to perfect it, in spite of the unremitting attention of the best business and scientific talent, that has been bestowed on it. The refining plant in Wales is now in excellent order, and as the great stocks of matte accumulated at Sudbury, Ontario, have been worked off, mining and smelting operations have once more been resumed. The demand for nickel is excellent, and the directors consider it advisable to issue the remainder of the preference shares, amounting to £125,000, in order to increase the output. I understand that the applications for the new shares are much in excess of the amount issued. As they carry 7% cumulative dividend and there are no debentures, they are really an excellent investment. The company has paid all preference dividends to date, and for 1904 paid 6% on the ordinary shares. It is interesting to note that the company is making nickel sulphate, which is much in demand among nickel-platers.

During the past few years I have referred several times to the Smelting & Refining Co., of Australia. This company was originally started as a custom smelter by Mr. John Howell, but owing to a lack of supply or ores, operations were suspended and the works remained idle for a long time. Then the company was revived by some Anglo-Americans, and for a time hopes of success were great. However, difficulties that John Howell could not overcome cropped up before long. Profitable ores were scarce, and competition for them was keen. Rate cutting was resorted to by the company, only to its own detriment. The many incidents in connection with the management and direction need not be recapitulated now. Finally the American element disappeared and the stranded English shareholders were left to rescue themselves. A committee of shareholders was appointed to consider what was best to be done. This committee had two good steel men among them, and they naturally were more interested in the scheme for smelting New Caledonia ores than in the silver, lead and gold ores of Australia. The last legacy of the Anglo-American control was a contract with the Consolidated Nickel Mines, Ltd., whereby the latter was to ship so much ore a year to Dapto, and to subscribe for shares in the smelting company. Unfortunately, the Consolidated Nickel Mines shipped large consignments and never received payment, so coming to the end of its financial tether. Both companies are therefore in a state of ruin. After much consultation, the committee of shareholders advised a consolidation of the two companies and the subscription of new capital, which, on the face of it, seems to be the only practicable proposition. A meeting of shareholders of the Smelting & Refining Co. was therefore held, and the proposition for the amalgamation carried. The directors, the committee, and the shareholders themselves, have inherited the spirit of the Anglo-American control, for they calmly discussed the disposition of their property, which happens to be in the hands of the debenture holders who foreclosed some time ago. The proposition of the shareholders' committee had never been submitted to the debenture holders. Surely they should have been consulted before the shareholders. However, I hope they will accept the proposition, for the smelters will be useless otherwise.

General Mining News.

Amalgamated Copper Co.—The directors, at their meeting last week, voted to make the quarterly dividend 1¼%, to be payable August 28. The dividend record of the company shows that it began by paying 8% in 1900, dropping to 7½% in 1901, to 2½% in 1902, and to 2% in 1903. The rate of 2%, or 0.5% quarterly, was kept up through 1904. In February of this year the quarterly rate was advanced to 1%; this was continued in the May dividend, and now the further advance to 1¼% is made. No statement accompanies the declaration of the dividend.

It has been widely reported—and generally believed— that John D. Rockefeller has recently taken 100,000 shares of the company's stock. This is said to be his first direct personal investment in Amalgamated, and there is much speculation as to its meaning.

ARIZONA.

COCHISE COUNTY.

Chiricahua Development .Co.—At the main or Planet shaft, from which at the 400-ft. level this company is driving the cross-cut to tap the ledge and contact, they are in 550 ft., and according to the survey they will only have to go from 50 to 100 ft. further. The original survey taken from the dip of the vein, as shown by the cross-cut 250 ft. below the apex, gave the distance from the shaft to the vein as 602 ft. The company intends to install another boiler that will double the steam capacity. As soon as the station at the 400-ft. level is finished, it will place a large stationary pump, which is now on the ground. At the Mars shaft the work is going ahead, and at this shaft they have developed a body of low-grade copper ore, containing a large percentage of magnetic iron. The copper percentage, however, is high enough to make the ore a profitable smelting one.

Manhattan Development Co.—The contractors are rushing work in the tunnel and winze. They are making a good showing and are in ore in the winze.

Cochise Consolidated Copper Co.—Development is progressing satisfactorily. At the Ainsworth shaft, sinking continues and they are now down 120 ft. They report they will sink this perpendicular shaft to a depth of 400 ft., when they will cross-cut to the contact. At the Mascot shaft they are down 175 ft. and have just let a contract to sink it 50 ft. deeper. At the adit on the zinc vein work continues. They are now in a distance of 215 ft. They have just started an adit further up the hill, above the Mascot shaft, which will cut the contact in about 100 ft. This adit is in copper ore.

Savage Gold & Copper Co.—The main tunnel continues in good ore. The air-shaft has been connected with the main shaft, and sinking will now be resumed. The grading for the smelter has been finished and erection of the machinery is under way.

MARICOPA COUNTY.

Santa Ysabel Mining & Milling Co.—Stockholders of this company at the annual meeting at Phœnix, recently, voted to authorize the directors to offer the stockholders the privilege of purchasing at 15c. per share 436,552 shares of the company's stock which were not taken under the reorganization agreement. The right to subscribe will expire August 19. Such stock as is not taken by the stockholders will be disposed of by the directors.

SANTA CRUZ COUNTY.

Mowry Mines Co.—The old Mowry mine, at Patagonia, which was one of the first silver-lead mines to be worked west of the Rocky mountains, it having been exploited on an extensive scale previous to the Civil War, has now been developed to a depth of 600 ft. Extensive bodies of lead carbonate ore have been disclosed. The company is now about completing a smelting plant, comprising one blast furnace, which will probably have capacity for the reduction of 80 tons of ore per day. The ore is self-fluxing. The main office of this company is in New York city.

ARKANSAS.

The Legislature of this State recently passed a law providing that all coal mined in the State must be weighed before it is screened, and that miners must, in all cases, be paid according to the unscreened weight. The remarkable part of this law is a clause directing that "any provision, contract or agreement between mine owners, lessees or operators thereof, and the miners employed therein, whereby the provisions of this article are waived, modified or annulled, shall be void and of no effect, and the coal sent to the surface shall be accepted or rejected; and if accepted, shall be weighed in accordance with the provisions of this article, and right of action shall not be invalidated by reason of any contract or agreement."

It seems doubtful whether the courts will uphold this clause, should an appeal be made to them.

CALIFORNIA.

BUTTE COUNTY.

Wyandotte Mining Co.—This company at Wyandotte, H. Zilmer, manager, has made a strike on the Bliss mine on the lands of J. T. Rutherford and James Stevenson, which they hold under bond. The ledge of gold-bearing quartz uncovered carries high values.

MARIPOSA COUNTY.

Woodchopper.—At this mine F. Brandt, F. Hutchinson and J. C. Dunn have recently completed a tunnel to tap the bottom of the shaft and will soon commence stoping.

MONO COUNTY.

Casa Grande.—R. Mitchell, of the Dunderberg mine, near Bridgeport, has bought half of this mine.

NEVADA COUNTY.

Manhattan.—This mine, Gold Flat, under bond to Moss & Co., of San Francisco, is to be reopened. The mine adjoins the Chicago.

St. Louis.—This mine, near Nevada City, has been sold by Mrs. Celia Gwyn, Mrs. J. J. Lyons and William Hampton to J. F. & I. Fredericks, of Virginia City, Nev. The tunnel is being cleaned out preparatory to working the property on a large scale.

Buckeye Mining Co.—Plans have been completed for a 10-stamp mill for this mine near Nevada City. Development is being pushed on a new vein recently discovered on the tunnel.

Home Mining Co.—On this property, Nevada City, John McFaull, superintendent, there are 95 men at work and 35 stamps are kept busy on ore of good value. The old Glukas shaft, sunk 40 years ago, is being reopened.

PLACER COUNTY.

Bellevue.—The machinery recently installed at this mine, near Auburn, is about ready to start up.

Tadpole.—In this mine, near Westville, six distinct ledges have been found in the last six months. The ore taken out will be crushed in the Alameda mill until the mine proves that it needs a mill of its own.

PLUMAS COUNTY.

Round Valley.—W. J. Droege, manager of the North Cañon Quartz Mining Co., is putting down drill holes in the valley to determine the value of the land for dredging purposes. In early days many hydraulic mines were worked on all sides of the valley.

SHASTA COUNTY.

Great Western Gold Co.—This company's smelter, at Ingot, has been idle some weeks, the zinc in the ore making the present methods of smelting practically a failure. The president of the company is bringing a zinc expert from the East to try and solve the problem. The mine continues to be worked with a full force of men.

Eureka Tellurium Mining Co.—This mine, on Middle creek, is about to be reopened by the company owning it. Sidney Williams, formerly of Denver, Colo., has a process for reducing the ores, which is about to be tried, and a plant will be erected.

SAN LUIS OBISPO COUNTY.

Garibaldi.—This quicksilver mine, near San Simeon, has been bonded for $10,000 to Mr. Hamilton, of San Francisco.

SISKIYOU COUNTY.

Morrison & Garlock Mining Co.—In this mine, Quartz valley, the orebody is increasing in size with depth. The 10-

stamp mill is running on high-grade ore.

Hydraulic Mines.—Many of the hydraulic mines along Klamath river have been compelled to close down, owing to shortness of the water supply.

SHASTA COUNTY.

Mines Sold.—J. L. Montgomery has sold the Silver King, Rattler and Rattlesnake mines, and the Montgomery mines on Montgomery mountain to J. A. Ewing, F. Parker and W. R. Armstrong, of Los Angeles. A. C. Barker will manage the work. The mines are a few miles from Redding and were at one time productive.

Simoni.—This property on Middle creek, formerly known as the Muchmore, and comprising the Keswick View, Lucky Slope, Poverty Hill, Kruger and Big Spring claims, has been bonded by Burt Wiser to F. & A. Hurst and E. V. Johnson, of Redding. Active development will begin at once. The 10-stamp mill is to be overhauled and put in order.

Black Bear Mining Co.—This company, at Black Bear, John F. Daggett, president, and Ben. Daggett, superintendent, has developed a new vein on the 500-ft. level. The mine produced over two milliom dollars in its palmy days, but in the past few years has not been profitable. Governor Daggett has been searching for the ledge for several years and has now found it again.

TULARE COUNTY.

Upper Deer Creek.—In this section of the county recent developments are very encouraging to the prospectors. In the Royal Flush mine, 8 miles from Hot Springs, located by J. L. Showers, is a ledge from 4 to 6 ft. wide, carrying good milling values. The Deer Creek Mining Co. has been formed to work this property and to erect a mill.

COLORADO.

Colorado Fuel & Iron Co.—This company has lately contracted with Corrigan, McKinney & Co., for 100,000 tons of iron ore from the Stevenson mine, at Hibbing, on the Mesabi Range, in Minnesota. The ore will be shipped by rail to Pueblo, Colo. The company states that the location where it has found the largest body of bessemer ore within reach of existing transportation facilities is at its Chicago property, two miles north of its Sunrise mine and about nine miles from the Burlington tracks at Guernsey, Wyo. Prospecting has been actively conducted upon this property during the past year and by means of drifts, shafts and diamond-drill holes a large body of high-grade bessemer ore has been found. An experimental shaft to verify the information obtained from the diamond-drill holes has been driven through it and the results shown were so satisfactory that actual development has been commenced of a mine, consisting of a first-class three-compartment shaft, now being driven day and night, and which upon completion will be equipped with modern hoisting machinery. The Burlington system is constructing a branch line with terminal yards and ample shipping facilities, and it is expected that shipments will begin about August 1. But the time required to open up properly the underground workings, to introduce 500 or 600 miners and operate the mine to full capacity will be so great that the company has found it necessary to cover its additional requirements during the balance of the present year by the purchase of this Minnesota ore.

MINERAL COUNTY.

Creede United Mines Co.—This company is a consolidation of several of the more important properties in the Creede camp, the properties absorbed including those of the Big Kanawha Leasing Co. and the Humphreys Tunnel & Mining Co. The officers of the company are: President, C. S. Thomas; vice-president, R. F. Kavanaugh; secretary, B. B. Brown; treasurer and general manager, George Davis; general superintendent and engineer, J. D. Hawkins. The offices of the company are in Denver. H. E. Lees is mine superintendent of these properties, and L. H. Norton is the superintendent in charge of milling operations. J. J. Fitzgerald is his assistant. The Humphreys mill, with a capacity of 250 tons daily, is running on ores extracted from the Happy Thought mine through the Worcester tunnel. The company is planning an early extension of this bore, which is already in over 10,000 ft. At the mill a slimes plant equipped with canvas tables, settling boxes, and possibly Sperry buddles, is under construction.

TELLER COUNTY—CRIPPLE CREEK.

Portland.—This company has declared its usual quarterly dividend of 6c. per share and an extra one of 4c. per share, making 10c. per share in all. The condition of this property is very good at present, making it possible to pay this extra dividend. In the previous quarter an extra dividend was also paid, this being from the proceeds of the sale of some Shortline bonds held by the company. The amount of the dividend just declared will be $300,000 when paid.

Beacon Hill-Ajax.—The minority stockholders of this company have obtained an order to make a survey and examination of the El Paso workings adjoining this property. It is alleged by these stockholders that when this property was sold to the El Paso company there was a large amount of ore in it, and that the property was sold away below its true value. Engineers are examining the El Paso and the troubles of the stockholders will doubtlessly be aired in court.

Railroad Changes.—A number of changes have been made in the railroad service in the Cripple Creek district since the merger of the two competing lines. A number of the suburban trains have been taken off and other changes have been made. There does not appear at present any tendency to raise rates.

IDAHO.

SHOSHONE COUNTY.

Success.—This is a local company, with offices at Wallace; H. F. Samuels, J. L. Bailor, A. H. Featherstone, C. F. O. Merriam and others being interested. The mine is the old Granite, located on Nine-Mile creek, 4 miles from Wallace. It has a vertical vein, operated to a depth of 650 ft. by means of adits and crosscuts. The ore comprises galena and silver, accompanied by zinc. A mill has been erected which will be operating by August 1. It provides for concentration to recover the lead and silver and magnetic separators for separating the iron and zinc. An oxidizing roast will be given the iron-zinc material before separating. This is the first zinc plant for the district.

Rex Mine.—This was formerly the Sixteen-to-One. It is now operating under lease to Theodore Anderson, who is milling and shipping the ore.

War Eagle.—About $20,000 has been spent on exploration work, including the driving of an 1,800-ft. crosscut, now almost to the mineral zone, which is on the contact of quartzite and slate. The property is near Wallace, on the south side of Cœur D'Alene river. Geo. R. Trask is in charge, and has New London, Wis., people associated with him.

Beaver Creek.—A. H. Hill and associates of the Beaver Mining & Development Co., are developing this group, having done 1,500 ft. of work in adits and raises. They have a vein of silver and lead ore of good grade, in a contact of slate and quartzite.

Snowstorm.—This is a copper mine, situated east of Mullan. Larson & Greenough, who own the Morning mine, recently purchased the interests of Tom Donnelly, H. H. Burns, H. Billberg, Joe Thinnis and others in the Snowstorm, giving the purchasers full control. The mine is young, but it has produced ore of the value of $300,000. Royalties amounting to $40,000 wer paid by Howard & Co., lessees. A copper leaching plant is being erected there.

ILLINOIS.

MACOUPIN COUNTY.

Chicago-Virden Coal Co.—Work is suspended at this company's mines, near Virden, about 1,000 men being out. Last week Manager F. W. Lukens posted notices that the men might return to work by doing their own shot-firing with less than 2 lb. of powder, the law stipulating that in mines firing shots of less than 2 lb. of powder shot-firers shall not be necessary. The miners refused to go to work and the matter is in the hands of the

executive board of the United Mine Workers. The manager claims that it is not necessary to use heavy shots to bring down the coal in these mines. The same stand is being taken by several other companies in the district.

SALINE COUNTY.

O'Gara Coal Co.—This company, recently organized in Chicago, with $6,000,000 capital stock, has bought 12 working mines, including all those operating in the Harrisburg field. Thomas J. O'Gara is president.

SANGAMON COUNTY.

Standard Wash Coal Co.—This company has its main office in Chicago and operates a coal mine at Herrin. W. T. Delihart is president and M. C. O'Donnell secretary. Recently the company bought out the property of the Spaulding Coal Co., consisting of the collieries at Spaulding and Bissell. The price paid was $200,000, of which $133,000 was in cash, the purchaser assuming $67,000 in bonds secured on the property.

INDIANA.

As a result of the big deals in coal lands in Knox, Sullivan and Greene counties, abstractors in large numbers are busy workers at their respective county seats. Thousands of acres are being purchased by the railroad companies, as well as the syndicates, and men are busy preparing the abstracts on these tracts of land. Over 3,000 acres in the vicinity of Vincennes passed into the hands of the Vandalia Co. last week, while agents for John R. Walsh have secured coal leases on several thousand acres in Gibson county, near Summerville, on the Evansville extension of the Southern Indiana railroad. Under the terms of the lease Walsh is to begin drilling for coal within fifteen days.

CLAY COUNTY.

Ideal Block Coal Co.—This company has been organized to mine coal near Turner. The capital stock is $25,000. The directors are J. P. Cummisky, J. A. Curtis, W. E. Baubie and F. A. Robertson, all of Detroit, Michigan.

MORGAN COUNTY.

Gold Creek Mining Co.—This company, now operating by improved methods and apparatus in Morgan county, Ind., has put its stock on the market and there is little doubt but that it will sell rapidly. No statement has been made of results obtained thus far.

MICHIGAN.

HOUGHTON COUNTY—COPPER.

Calumet & Hecla.—The annual meeting of this company will be held at the office in Boston, August 16, at 10 A. M. The stockholders will be asked to vote to amend the by-laws in order to enable the company to avail itself, through its directors, of the provisions of an act of the Michigan legislature, as follows: Article 18: "The directors at their discretion may, by such officers or agents as they may from time to time designate for the company, subscribe for, purchase, acquire and dispose of stock in any other company organized for the purpose of mining, refining, smelting or manufacturing any or all kinds of ore, minerals or metals." Also to amend Article 11 of the company's by-laws, by the addition of (after the words "vice-president") the words, "a second vice-president, a third vice-president."

The first amendment noted probably refers to the new companies, the incorporation of which, by Calumet & Hecla officials, was noted in our news columns last week. It is rather a new departure for the company.

Centennial.—Results show further improvement. In June the stamp mill treated 5,720 tons of rock, which yielded 146,238 lb. of copper, or 1.278%, the record for the present year. The twenty-second level north and south of No. 1 shaft is in good ground. No. 1 shaft is now approaching the twenty-eighth level. The drifts north on the twenty-fifth, twenty-sixth and twenty-seventh levels are entering rich copper ground. The stamp mill at Grosse Pointe is running during the day shift only, the rock shipments from the mine averaging 250 tons daily. Until more drills are put at stoping, the mill will continue on its present scale.

NEW MEXICO.

New Mexico Railway & Coal Co.—This company is offering for sale four issues of bonds secured on its railroads and coal properties. The coal property covers about 26,000 acres of land, including several working mines and a number of places where the existence of coal-beds has been proved. A part of the proceeds of the new bond issues will be used for the opening of new coal mines, the erection of coke ovens and other mining improvements. The stock of the company is controlled by Phelps, Dodge & Co., of New York, and a large part of the coal produced will be used by the mines and smelting works owned by that firm in Arizona and Mexico.

PENNSYLVANIA.

BITUMINOUS COAL.

Morris Run Mining Co.—Recently this company asked its miners to accept a 10% cut in wages, the company claiming it could not operate the mines at the scale of wages asked by the union. The mines have been worked only one or two days a week, which did not give the miners a sufficient amount to support their families. They refused to accept the reduction in wages and a notice was posted by the company stating that because of the heavy cost of operating and the refusal of the miners to accept the reduction in wages, it would be necessary to shut down the mines indefinitely.

Pittsburg Coal Co.—The directors on July 18 decided unanimously to declare no dividend at this time on the preferred stock. While the outlook is now stated to be good, the recent competition and low prices in the bituminous coal trade resulted in reducing the net earnings for the late quarter to about one-half the amount which would be required to pay the dividend. After the meeting President Robbins issued a brief statement, in substance as follows: "The net earnings, partly estimated, for the quarter ending June 30, were $574,556; deducting interest on bonds, $304,550, the net balance left was $270,006. The balance of net earnings as above not only remains after the payment of interest on bonds, but also after apportionment to the sinking fund and all fixed charges. The preferred is a 7% stock, making the dividend requirement $560,000 for the quarter. The above statement showing net earnings for the quarter to be $270,006 would indicate a shortage of $290,000 in meeting the quarterly dividend. The preferred stock, however, is cumulative, and all dividends in arrears must be met before a dividend is declared on the common. The necessity for passing the dividend at this time is due to the recent competition in the bituminous coal fields; but with the current boom in the iron and steel trade, and favorable conditions in the bituminous regions, the outlook is promising. Another cause for adverse conditions was the fight last spring against the independents for the control of the Lake trade, and with these conditions now removed the next quarter should show better results."

The Monongahela River Consolidated Coal & Coke Co., of whose capital stock the Pittsburg Coal Co. owns $15,000,000 common and $2,500,000 preferred, reports partly estimated net earnings of $300,000 for the eight months ending July 1, but the directors at their meeting on July 18 decided to defer action on the preferred dividend. The dividends on the preferred ($10,000,000) were 7% yearly, July, 1900 to January, 1904; in July, 1904, the dividend was passed; but in January, 1905, a dividend of 1.54% (77c. per share) was paid from earnings of fiscal year 1903-1904.

TEXAS.

HARRIS COUNTY.

A fire in the Humble oilfield, said to have been started by lightning striking an iron tank, this week destroyed 11 tanks, with 2,500,000 bbl. of oil. Besides the property loss, 12 men were killed while trying to fight the fire. At latest accounts it was still burning, and it was feared that the fire would reach the remaining tanks in the field, holding some 4,000,000 bbl. of oil.

UTAH.

BEAVER COUNTY.

Frisco Contact.—The shaft now being sunk on this property is down 210 ft. and will be continued to at least 400 ft. If the

ore is not cut on the dip of the vein, a crosscut will be run to it. This company has an extension of the old Horn Silver vein.

Majestic Copper.—Development work is still progressing at the O. K. and Old Hickory mines. It is doubtful when the smelter at Milford will go into commission again.

BOX ELDER COUNTY.

Sunrise Mine.—After a ten days' run on ore sent from this property to the Contury mill for treatment, a gold bar of the value of a little over $2,000 was shipped to a Salt Lake bank. The company has the privilege of operating the Century plant for a period of 30 days.

Boston & Terrace.—This property, in the Newfoundland district, is being energetically developed.

JUAB COUNTY.

Lower Mammoth.—The timbering of the winze between the 1,200 and 1,400 levels is completed, and ore is now being hoisted. It is the intention to sink the winze 100 ft. further.

Uncle Sam Consolidated.—The new air-compressor plant, ordered recently, is being installed. Drifting is in progress on the 500, and the winze from the 300 level has followed ore to a point below the 400 level.

Utah Mine.—This mine is shipping an average of a car a week. Settlements made on June 30 for 32 tons brought over $4,700, the controls showing 202 oz. in silver and 49% lead.

Columbus Consolidated.—This company has opened some large bodies of ore during the past few weeks. The mill is running 100 tons of ore a day, which makes 20 tons of concentrate.

SALT LAKE COUNTY.

Butler-Liberal.—The new hoist at this Bingham property is in commission and the company has resumed ore shipments.

WASHINGTON.

OKANOGAN COUNTY.

Phil Sheridan Group.—The Phil Sheridan Mining & Milling Co. was organized under the laws of South Dakota in May, 1905, to take over the Phil Sheridan group of three claims—the Phil Sheridan, Salamanca and Kismet Fraction. This property is tributary to Republic and situated about nine miles (air line), northwest of that camp, which affords the nearest railway communication and is the present supply point. The group has an approximate area of 2,000 ft. N.W.-S.E. and 1,200 ft. N.E.-S.W. It lies at the head of Toroda creek and west of a great bed of biotite granite, which traverses the western boundary of Ferry county for several miles. The highest elevation on the Phil Sheridan group is about 4,700 ft. above sea level. The Phil Sheridan vein crosses the claim diagonally and apparently passes into the Salamanca, cropping up and down a steep mountain slope. From exploitation by open cuts in several places, this vein appears to have an average width of about 4 ft., a part of the filling being gangue of eruptive material, but mostly quartz, bearing principally silver and having also values in gold. The Kismet Fraction claim, located north of the other two claims, is traversed by a quartz vein of about 10 ft. in width, with surface exposures of low- and some high-grade ore. The croppings, traceable for 600 or 700 ft., cross the north end of the Phil Sheridan claim and nearly parallel the end line a short distance west of the Phil Sheridan vein. Both veins trend northwesterly, but at different angles. Near the apex of the mountain an incline shaft had been sunk 75 ft. on the Phil Sheridan vein, when a half interest in the group was sold to W. A. Roberts, of Peoria, Ill. Since then an adit has been driven 220 ft., which crosses the vein about 25 ft. below the bottom of the incline. The vein is 3 ft. wide at the intersection. From the shaft selected samples were taken that ran high in silver and gold. Shipments of sorted ore showed high values in mill.

Foreign Mining News.

AFRICA.

TRANSVAAL.

The output of the Transvaal mines in June is reported by the Chamber of Mines at 412,317 oz. fine gold. This is 4,078 oz. less than in May, but 108,176 oz. more than in June, 1904. For the six months ending June 30 the total was 2,360,375 oz. fine gold, an increase of 549,240 oz., or 30.6%, as compared with the first half of 1904. The production in June exceeds the maximum monthly output reached before the war.

RHODESIA.

The gold production reported in June was 35,256 oz. bullion, the largest monthly output yet recorded. For the six months ending June 30 the total was 197,445 oz. bullion, an increase of 83,948 oz. over the first half of 1904. The bullion reported this year was equal to 175,726 oz. fine gold, or $3,632,265 in value.

MEXICO.

SONORA.

El Tigre Mining Co.—The former owners of this property, headed by B. F. Graham, took forcible possession of the mines July 7, claiming that the Kansas City buyers had failed to make a payment of $48,000, which was due on that date. On the other hand, the Kansas City parties maintain that the money was in the bank at Bisbee, subject to the call of Mr. Graham. In view of the unsettled state of affairs, it is probable that El Tigre property will be contested for in the Mexican courts.

Coal Trade Review.

NEW YORK, July 26.

ANTHRACITE.

The hard-coal market is unusually dull, sales being less frequent than at any time this summer, and less so even than last summer. Retailers are well stocked and consumers who have not already a full supply on hand since before July, do not trouble to order their stocks before September. The mines are maintaining a steady output, but if the present slowness in the trade prevails much longer, a reduction in output will inevitably be necessary.

Prices f.o.b. New York harbor shipping ports during July will remain as follows: Domestic sizes, $4.55 for broken and $4.80 for egg, stove and chestnut. Steam sizes remain at the same figures as last week: $3 for pea; $2.25@$2.50 for buckwheat; $1.45@$1.50 for rice, and $1.30@$1.35 for barley.

BITUMINOUS.

The Atlantic seaboard soft-coal trade is extremely quiet, and orders, when there are any, reach the producers in varying sizes, so that the trade is irregular. The action of the main-line railroads in keeping a close watch at their terminals, and cutting down car supply immediately upon the appearance of any accumulation, has eradicated the possibility of speculation; any large arrivals are now placed at once upon the market with the attendant lowering of prices. The only factor of interest in the trade is the low prevailing ocean freight rate, which is inducing a small amount of trade that would not otherwise be shipped just at this time.

Trade in the far East is dull, and is nearly all composed of contract deliveries. Trade along the Sound is quiet, but a slight improvement over a week ago is visible. In New York harbor, all the business being done is on contract; trade is particularly quiet, with prices ranging around $2.25@$2.30 f.o.b. shipping points. All-rail trade is well maintained and tonnages have remained steady for the last two months, with only slight cutting in prices. Transportation is slower, although this is not a cause of complaint, owing to the prevailing dullness. Car supply is up to demand, and the main lines are permitting their cars to go to foreign roads that are ordinarily embargoed.

Vessels in the coastwise trade are in good supply, particularly the large ones. Philadelphia quotes as follows: To Boston, Salem and Portland, 60c.; to Providence, New Bedford and the Sound, 50c.; to Lynn and Bangor, 75c.@80c.; to Newburyport, 80c.; to Portsmouth, 65c.; to Bath, 70c.; to Saco and Gardner, 90c. and towages. New York harbor charges 50c. to around the Capes.

COAL TRAFFIC NOTES.

Nova Scotia coal shipments for the half-year ending June 30 are reported as below, in long tons:

Company.	1904.	1905.	Changes.
Acadia	115,291	123,097	I. 7,806
Cumberland	204,543	187,675	D. 16,868
Dominion	1,218,525	1,156,586	D. 61,939
Intercolonial	74,669	56,081	D. 18,588
Inverness	121,368	88,089	D. 33,279
Nova Scotia	196,653	206,376	I. 9,723
Total	1,931,049	1,817,904	D. 113,145

The total decrease was 5.9%. Only two companies showed an increase over last year.

Coal and coke shipments originating on all lines of the Pennsylvania Railroad east of Pittsburg and Erie are reported as follows, in short tons, for the year up to July 15:

	1904.	1905.	Changes.
Anthracite	2,395,644	2,502,831	I. 107,187
Bituminous	14,317,821	15,018,184	I. 700,363
Coke	4,556,667	5,856,724	I. 1,300,0 5
Totals	21,270,132	23,377,739	I. 2,107,607

The main increase this year has been in coke.

Birmingham. July 24.

The coal production in Alabama is still improving, especially at the mines of the commercial coal companies. The reduction in mining wages did not disturb the production at the mines where union labor is employed. The "open-shop" mines, operated by the furnace companies, made no reduction in wages, as far as can be learned. There is still an importation of labor from the East, foreigners mostly, for the mines of the furnace companies. A large number of the striking miners have been able to get work in the mines of the commercial coal companies and other places. For the first time in many years the colored members of the unions have maintained the principles of the organization and are sticking out with the others. The union is supplying a large amount of provisions weekly to the striking members. The national organization is sending over $40,000 a week to this district.

The coke production is improving but little. There is an urgent need for this product. The scarcity of labor as well as the coal supply has much to do with the short production of this commodity.

Chicago. July 24.

Hardly any branch of the coal trade reports conditions for the last week as even tolerably satisfactory. The market has been uneven and irregular to an exasperating degree; both Western and Eastern coals have had fluctuations of an extraordinary nature, due chiefly to the upsetting of the market by the temporary suspension of mining in Illinois. The Illinois mines are now producing regularly, however, and the probability is that by the end of the present week conditions will be normal again—which means the usual summer dullness.

Smokeless is the firmest of the Eastern coals, but business in it is not heavy, normal summer dullness prevailing. New River and Pocahontas are quoted at $3.05, but this list price is probably cut 10c.@ 15c. on certain orders. Hocking is somewhat weak, and can be bought for $2.80 @$2.90, with an abundant supply on track. Youghiogheny is dull, with $2.80 minimum quoted.

Western coal is quoted; Lump and egg, $1.90@$2.30; run-of-mine, $1.60@$1.80, and screenings, $1.20@$1.60. These prices are likely to drop slightly in the next week.

Anthracite is very dull, with no probabilities of a recovery until the advent of cooler weather.

Cleveland. July 25.

The coal situation in this territory has not changed. The movement up the lakes is very slow, with no prospects of an increase. It might be expected that if the shipments this year are to be equal to those of a year ago, or in excess, the speed of shipment would be materially increased. On the contrary, however, there is a tendency toward an easier movement, indicating something of the extent of the increased all-rail shipments from western mines into the northwestern territory heretofore served by the Pennsylvania and Ohio mines. The price of ¾-in. lake coal holds at $1.90 f.o.b. Lake Erie docks. The rates of carriage are steady, but not strong, at 40c. to Milwaukee and 30c. to the head of the lakes.

The movement of steam coal seems to be picking up, with the resumption of work by some of the factories through this section, but better demand has not changed the price, and the market is only steady at 90c. for run-of-mine, with some producers selling for less. There continues to be a good demand for slack, with prices holding at 50c. for Pennsylvania at the mines and 60c. for Ohio slack at the mines, the difference being in the freight rate to the market.

The coke market is shown to be easier by the fact that the ovens are now willing to make contracts for delivery over the last half of the year at $2.50 at the oven for the best grades of 72-hour coke, with furnace coke selling at $2 at the oven.

Pittsburg. July 23.

Coal.—Prices are weaker, owing to competition, and complaint is made that the established rates are being shaded unnecessarily. Run-of-mine has dropped to 95c., but some sales were made this week at $1.05. Three-quarter inch coal is selling at $1.05, and it is reported that some sales have been made at $1. The mines are running satisfactorily and the prediction is made that the production in the Pittsburg district this year will exceed all former years. The Pittsburg-Buffalo Co. has broken all records for production, and other independent concerns are turning out larger tonnages than ever before. Surprise was caused by the very unsatisfactory report made by the Pittsburg Coal Co. and its affiliated interest, the Monongahela River Consolidated Coal & Coke Co. The quarterly dividends of both these concerns were passed at the meetings of the directors last week. The Pittsburg Coal Co. is making heavy shipments to the northwestern markets and the Monongahela Co. has made extensive shipments to the southern ports. Better reports are promised for the next quarter.

Connellsville Coke.—Coke prices are firm at $1.85@$2 for furnace and $2.35@ $2.50 for foundry; production and shipments are increasing. The production for the week is given at 246,792 tons, a gain over the previous week of 15,983 tons. The shipments aggregated 10,448 cars distributed as follows: To Pittsburg and river points, 3,986 cars; to points west of Pittsburg, 5,278 cars; to points east of Everson, 1,184 cars. This was an increase over the previous week of 967 cars.

San Francisco. July 20.

J. W. Harrison's circular of this date says: "Since our last there has been but one arrival of Australian coal, 2,265 tons. The loading list of coal carriers from Newcastle, N. S. W., foots up 21 vessels, with a carrying capacity of about 60,000 tons. No new freight engagements are being made, although very fair offers are reported, but ship-owners evidently do not like the appearance of San Francisco as a profitable port to order their ships to. The present outlook for future grain charters this year is very discouraging. The unsettled condition at present existing of coal laborers in British Columbia, and Newcastle, N. S. W., would, under ordinary circumstances, have created a marked advance in the local prices of coal here, whereas no change is apparent. This is very strong evidence that there is ample fuel on hand for all our requirements, and that the quantity required for our uses is becoming annually less. The sales of coal for domestic uses for the months of July, August and September always become materially diminished, as mild weather then prevails. There is a large supply of fuel oil daily delivered, with an ample reserve of same to draw from, as productive wells are being opened all through the oil sections. The oil is delivered at about the same price, and contracts are being offered extending over long period at unchanged values."

For Coast coals, in large lots to dealers, prices are as follows: Wellington, New Wellington and Richmond, $8; Roslyn, $7; Seattle and Bryant, $6.50; Beaver Hill and Coos Bay, $5.50; White Ash, $5.25. For Rocky Mountain coals, in car lots, quotations are: Colorado anthracite, $14; Castle Gate, Clear Creek, Rock Springs and Sunny Side, $8.50. Eastern coals are nominal at $14 for Pennsylvania anthracite, and $13 for

Cumberland. For foreign coal quotations are, ex-ship: Welsh anthracite, $13; cannel, $8.50; Wallsend and Brymbo, $7.50 per ton.

Foreign Coal Trade.

July 26.

Exports of fuel from Great Britain for the half-year ending June 30 are reported as below, in long tuns:

	1904.	1905.	Changes.
Coal	22,604,579	22,893,560	I. 288,981
Coke	328,503	318,861	D. 9,642
Briquettes	653,586	553,206	D. 100,380
Total	23,586,668	23,765,627	I. 178,959

In addition to these exports, the coal sent abroad for the use of steamships in foreign trade was 8,334,461 tons in 1904, and 8,480,457 tons in 1905; an increase of 146,086 tons. The total coal sent beyond the limits of the United Kingdom during the half-year was, therefore, 32,246,174 tons; or, approximately, 27.5% of the production.

The exports to the United States, included above, were as follows for the half-year:

	1904.	1905.	Changes.
Atlantic ports	25,107	19,617	D. 5,490
Pacific ports	61,438	60,651	D. 787
Total	86,545	80,268	D. 6,277

There was a small decrease this year in the exports to both coasts. The more important exports were: To Germany, 3,806,235; Italy, 3,306,476; France, 3,191,891; Sweden, 1,230,088 tons.

Iron Trade Review.

New York, July 26.

The stronger buying tendency in pig iron continues to be a feature in the trade. The larger buyers have been in the market freely, and smaller buyers will probably be in evidence soon, as they generally follow at an interval. It is evident that prices are at a turning point, as accumulations of iron have been cleared away. In fact, Southern makers, having sold out their stocks, are now holding at $11.50 and $11.75 at furnace for No. 2, the lowest point having been $11. Northern furnaces are also making some advances on future business.

In finished material also, the tone is firmer. Business is unusually active for the season, and a great deal of material is being taken. Bars, plates and sheets are all sharing in the activity. In structural material the situation is almost unprecedented, and the mills have great difficulty in meeting the demand. This is made up, in great part, of a large aggregation of small orders, though important contracts are not lacking and others are ready to come on the market.

Apparently the turning point has been reached, and the active full trade expected is on a month earlier than most observers had looked for it.

Pittsburg advices are that opposition is to be withdrawn to the completion of the Wabash connections—through the Pittsburg Terminal Railroad—with the Carnegie steel works and those of the Jones & Laughlin Co. It is reported that the Wabash will receive a fixed proportion—25%—of the Carnegie freight out of Pittsburg. This settlement is probably connected with the recent adjustment of freight rates with the Gould lines west of the Mississippi, and with the withdrawal of the Colorado Fuel & Iron Co. from certain competitive business.

Pig Iron Production.—The American Iron & Steel Association reports the production of pig iron for the first half of the year as follows, in gross tons:

	1904.	1905.
Foundry and forge	2,225,725	2,888,604
Bessemer pig	4,530,946	6,008,427
Basic pig	1,061,901	1,966,592
Charcoal iron	213,356	170,512
Spiegel and ferro	114,510	129,040
Total	8,173,438	11,163,175

Charcoal iron was the only kind showing a decrease. The total increase, as compared with the first half of 1904, was 2,989,737 tons, or 35.6%; as compared with the second half of 1904, the gain was 2,839,580 tons, or 34.1%. For the first half of 1905, the classification by fuels shows iron made as follows: Charcoal, 170,512; anthracite coal alone, 15,147; anthracite and coke, 815,028; coke and bituminous coal, 10,162,488 tons.

The number of furnaces in blast on June 30 was 294, against 261 on December 31, and 216 on June 30, 1904. Stocks of iron unsold on June 30 were 539,269 tons, an increase of 92,827 tons over December 31 last.

United States Steel Corporation.—The statement for the quarter ending June 30 is as follows:

Net earnings	$30,305,116
Sinking funds, subsidiary cos	$482,991
Depreciation and reserve	5,009,563
Improvements and replacement	1,000,000
Interest and sinking fund, Corp. bonds	6,936,962
Total charges	$13,429,516
Net balance	$16,875,600
Dividend, 1¾% on preferred stock	6,304,919
Surplus	$10,570,681

From this surplus appropriations have been made of $5,000,000 for new construction and additional property, and $2,500,000 for proposed expenditures; leaving a balance of $3,070,681 unexpended. The total net earnings for the half-year ending June 30 were $53,331,012, which compares with $32,935,957 for the first half of 1904, and $61,711,015 for the first half of 1903. The earnings for the June quarter show an increase of $7,279,220 over those for the first quarter of this year, and an increase of $10,814,391 over the second quarter of last year. The unfilled orders of all kinds on July 1 amounted to a total of 4,829,655 tons, as compared with 5,591,560 tons on April 1; 4,696,203 tons on January 1; 3,027,436 tons on October 1, 1904; and 3,192,277 tons on July 1 of last year.

Birmingham. July 24.

There has been a better demand for iron in the Southern territory during the past week than for several months, and the quotations have advanced so that No. 2 foundry is being quoted right along at $12 per ton. The sales already made this month aggregate more than the probable make for two months, while inquiries are in hand for at least two more months' make. One company states that all its surplus iron has been sold; another, that its accumulated iron will shortly begin to disappear, and that some attention will have to be given to production. The United States Cast Iron Pipe & Foundry Co. has been placing orders for a large quantity of iron, one company booking an order for 10,000 tons. The past week two or three other producers succeeded in getting some of the business, and at an advance of from 50 to 75c. on the ton. The Sloss-Sheffield Steel & Iron Co. will blow in its North Birmingham furnace in a few days, instructions having been given to that effect. Southern pig iron is being shipped in all directions. The consumers are asking generally for immediate delivery. A few sales have been made for delivery during the last quarter of the year, but inquiries are in hand which show that there will be no accumulation during that period. The Sloss-Sheffield Steel & Iron Co. up to July 20 had sold 73,000 tons of pig iron during the month.

The following quotations are given: No. 1 foundry, 12@$12.50; No. 2 foundry, $12; No. 3 foundry, $11.50; No. 4 foundry, $11; gray forge, $10.50; No. 1 soft, $12@$12.50; No. 2 soft, $11.50@$12.

The same activity as has been reported for the last four weeks prevails in steel circles in this district. The various steel plants are working on full time.

E. E. Linthicum, formerly with the Anniston plant of the United States Cast Iron Pipe & Foundry Co., was in Birmingham during the past week and announced that the American Cast Iron Pipe Co., recently organized, with Atlanta, Ga., captialists interested, would likely locate a plant in the Birmingham district. He announced that Anniston, Gadsden, Bessemer and North Birmingham, all in Alabama, were bidding for the plant.

Messrs. Veitch are erecting a foundry at Bessemer, Ala., and have been promised work enough to keep them busy for at least twelve months.

Chicago. July 24.

To all appearances the turn of the market has arrived; sales of pig iron for the last week have been heavy—80,000 tons at least—and all signs point to a rising market. The wonder of men in the trade is that the change, apparent or real, has not occurred sooner. For the last two months every indication of the trade in finished products has pointed to an ad-

vance in pig iron. Southern is firm at $12, Birmingham, or $15.65 Chicago, an advance of 50c. on the lowest quotations of a week ago, though actual sales were known to be as low as $11 Birmingham. Northern is quoted at $16.50, though sales may have—and probably have—been made as low as $16. It is safe to say, however, that no sales have been made today at less than $16.50, and a rise is probable this week.

The present demand for finished products is not in accord with the rise in pig iron, but it has followed trade conditions. To judge from present indications, we shall have the abnormal condition of a sharp rise in the market in the midst of the summer season, when everything is supposed to be dull until September. It is certain, however, that foundrymen have been running as close to the wind as possible, and they are greatly in need of iron now. Only one conclusion is possible from this certain premise—that the buying must be heavy and continue to be heavy, once it starts in earnest, on the belief that the bottom of the market has been reached and passed.

Inquiries continue heavy, and indicate that the trade is willing to turn to heavy buying as soon as the trend of the market is definitely known. It would not be surprising if the week just begun should show the heaviest sales of pig iron yet recorded this year for the Chicago district.

Coke is still somewhat light in volume of sales, but indications are that this week will show much heavier trade. The best Connellsville is quoted at $5.25, or $2.60 at ovens, with standard cokes 25c.@50c. lower.

Cleveland. July 25.

Iron Ore.—The movement of ore down the lakes by wild boats is limited, but there is a good movement by contract tonnage. The rates of carriage have not been disturbed, but could probably be broken should any pressure be exerted. The market is easier, therefore, at 75c. from Duluth to Ohio ports; 70c. from Marquette and 60c. from Escanaba. There is a possibility of a few sales of ore later in the season, but previous buying has been so heavy that there is hardly a likelihood of any big movement. The prices have not changed from $3.75 for bessemer Old Range; $3.50 for bessemer Mesabi; $3.25 for non-bessemer Old Range, and $3 for non-bessemer Mesabi.

Pig Iron.—There has been unusually heavy buying of pig iron of the foundry grade during the week and some furnaces are sold up to the point where they feel justified in demanding an advance. The sales are being made now at $14.25 in the Valleys, with some furnaces holding for $14.50. Other furnaces, which are in better shape, are asking $15 in the Valleys, but have made no sales at that figure.

Finished Material.—The big feature of the market this week has been the heavy buying of steel bars, the orders in this territory aggregating 60,000 tons. There has been also some good buying of bar iron. It is intimated that most of the year's business in bar steel will be closed inside a month or six weeks, the price being steady at 1.50c. Pittsburg for both bessemer and open-hearth. Bar iron is quoted at 1.50c. at mill, although there have been some sales made at lower and at higher prices. The difficulty of getting structural steel has also increased the price, premiums as high as $7 a ton having been paid during the week.

New York. July 26.

Pig Iron.—Sales of foundry iron have been large. Accumulated iron, especially Southern, has been cleared out, and furnaces are inclined to look for higher prices, Northern makers having generally advanced 25 or 50c. for future orders; while Southern sellers are talking of $11.75 or $12, Birmingham, for No. 2, fourth-quarter delivery.

For Northern iron in large lots we quote: No. 1 X foundry, $16.25@$16.75; No. 2 X, $15.75@$16.25; No. 2 plain, $15.25@$15.75; gray forge, $14.25@$14.75. Virginia foundry is $16.90 for No. 1 and $16.40 for No. 2. Southern iron has been pretty well sold, and is now held on a higher basis, but current prices have not changed. For large lots here on dock we quote: No. 1 foundry, $15.50@$16; No. 2 $15@$15.50; No. 3, $14.50@$15; No. 4, $14@$14.50; No. 1 soft, $15.50@$16; No. 2 soft, $15@$15.50; gray forge, $13.75@$14.25.

On the Produce Exchange, business has been slow, as usual. The latest quotations are $14.90 bid, $15.20 asked, for regular warrants; $15.10 bid, $15.50 asked, for foundry warrants.

Cast Iron Pipe.—Orders indicate a good fall trade and the pipe-makers are still taking good lots of iron.

Bars.—Bar iron is selling well, but in a small way only. Quotations are the same, 1.595@1.645c., large lots on dock. Steel bars are 1.645c. Store trade is fair, with quotations 1.75@2c. delivered.

Structural Material.—Considerable business is noted. Most of the local trade is small orders coming to jobbers. Premiums are being asked for early deliveries. Beams under 15-in. are 1.745c. for large lots; over 15-in. 1.845c.; angles and channels, 1.745c., tide-water delivery. Large orders are going, but are negotiated directly with mills.

Plates.—Plates are in demand in small lots. Tank plates are 1.745@1.795c.; flange and boiler, 1.845@1.945c.; universal and sheared plates, 1.645c. up, according to width.

Steel Rails.—No change in standard sections. More orders for trolley rails are noted. Light rails are quite active, prices ranging from $20.50 for 35 lb., up to $24.50 for 12-lb. rails.

Old Material.—The market is more active, and prices are steady. No. 1 railroad wrought can be had for $15.50@$16; No. 1 yard wrought, $14@$14.50; machinery cast, $13@$13.50. There is some demand for heavy steel melting scrap, and sales are made at $13.50@$14. These prices are on cars, Jersey City, or other terminal delivery.

Philadelphia. July 25.

A careful inquiry among a number of the smaller consumers of pig iron in this market has been made, in order to ascertain, if possible, what effect has been produced by the recent flurry in prices and demand. A number of our consumers are taking very little stock in the threatened upward tendency in pig iron, and comparatively few of them have placed contracts lately, as they have a good deal of material due them from the furnaces. A good deal of iron, however, has been sold or contracted for, but it has been taken by the bigger consumers, who show more anxiety to buy iron for late delivery. The big consumers say that the little ones will wake up some day and find that iron will be 25c. higher at least. The current quotations are not far from where they have been for some time past, and may be given at $17.50 for No. 1 X foundry; $16.50 for No. 2 X; $16 for No. 2 plain; $14.75 for standard gray forge; basic is $15.50. Southern No. 2 foundry is quoted today at $15.50, and Southern gray forge is $14. The makers of Southern iron have become impressed with the notion that things are coming their way as to prices, and the heavy orders which some of the companies have recently placed have made them very indifferent as to new business.

Billets.—The meeting which was held in New York on Monday did what our people here expected in the re-affirmation of prices at the present official figures. The usual $2 to $3 advance over official prices is being charged and readily paid.

Merchant Bar.—The merchant iron makers report an improving retail business at the usual prices, and the entire rolling-mill capacity is now engaged and the iron is shipped as fast as made. There is some quiet buying going on by car builders, concerning which no information can be squeezed out. Steel bars are very strong at the usual figures.

Pipes and Tubes.—Quotations on pipe have not been changed as rumored, and the discounts on tubes remain where they were under a steady demand.

Plates.—The makers of steel plate report today the continuance of an active demand, but much of their business of late has been for rather small lots. There is but little difficulty in arranging for comparatively prompt deliveries.

Structural Material.—There seems to be no end of orders and inquiries and no end to the springing up of new requirements, many of them coming from almost unheard-of localities. A high authority in structural ironmaking stated today that this year's business is peculiar over that of other years in this respect, that there is a larger volume of business in the aggregate made up of small amounts.

Scrap.—The market is more active this week, and the prices which have been paid for the most desirable scrap are 50c. a ton higher than last week. Those who have been buying evidently waited until they could wait no longer, for they are stipulating for early delivery. Quotations for old rails, $16.25; choice railroad scrap, $16.50; No. 1 steel scrap, $16; machinery scrap, $14.50, with old steel axles quoted at $17 and No. 1 forge-fire scrap active at $13 per ton.

Pittsburg. July 25.

General conditions in the iron and steel trade continue to improve and indications point more strongly than ever to an active buying movement before the opening of the fourth quarter and that next year will break all records of production. At the meetings of the billet, plate and structural associations in New York it was decided to re-affirm the established prices and to continue the premium plan. All reports presented at these meetings were of a most favorable nature, and but few of the interests represented argued for an advance. It was agreed that to increase prices might lead to shading in some instances, and result in disturbing confidence of buyers. There is nothing in the agreement among the associated manufacturers to prevent them quoting any price above what has been decided upon as the minimum. Premiums in the important lines have prevailed for several months, but it was believed that billets would come down to the established price for last half delivery. This now seems to have been a mistaken impression, although some sales of bessemer billets are said to have been made at the pool price of $21 for future delivery. Open-hearth billets cannot be had at less than $22.50 or $23, and sheet-bars are firm at $24 and $25, or $1 and $2 above the price established by the pool. On all new business for structural material and plates premiums are paid, and likely will continue to be paid for the rest of the year. The large interests have refused orders for structural material and plates for this year's shipment, as most of them are filled with business that will keep the mills running steadily until spring. The merchant steel-bar mills are also busy, as specifications on old contracts are very heavy and a number of new orders have been booked lately. There is an improvement in steel rails and the Ohio works of the Carnegie Steel Co. have been changed from sheet-bars to rails. While the rail tonnage this year will not be as great as last year, it will be much heavier than was expected a few months ago. There is some talk here of an early meeting of the rail-makers to arrange for next year, and it is positively stated that there will be no change in the price of $28 for standard sections. A representative of a leading steel interest declared today that from present indications the bulk of the rail tonnage for 1906 will be placed before October 1 and that the requirements of the railroads will exceed both this year and last year. The Carnegie Steel Co. started its Shenango Valley steel plant at New Castle yesterday, the repairs necessitated by the accident to the machinery several weeks ago having been completed. The blast-furnaces that had been banked at the time the works closed are again in operation. The company is now operating all of its blast-furnaces, except one at Youngstown, which is out for repairs, one at Niles, one at Zanesville and two at Columbus. The steel works at Columbus are also idle, but will be started as soon as the union mills of the American Sheet & Tin Plate Co. resume operations. Extensive repairs are being made, and it is announced that the idle sheet and tin-plate plants will all be running about the middle of August. A number of independent sheet and tin-plate interests have signed the wage scale of the Amalgamated Association of Iron, Steel & Tin Workers, and some have resumed operations. All are expected to sign as soon as they are ready to start. There is a slight improvement in wire and merchant pipe.

The pig-iron market shows a decided improvement, although some of the large orders that were expected to be placed this week have not been closed at this writing. Reports received here indicate that some large contracts have been made in different sections of the country and that sales were made within the past two weeks of about 75,000 tons of Southern and 50,000 tons of Northern pig iron. Some sales were made in this district at the minimum prices quoted last week, but higher prices are asked this week and there is every indication that $15, Valley, will be reached within the next two months. The demand for iron is greater than ever, and all of the iron mills in the Pittsburg district are in full operation. There is a scarcity of puddlers in some mills and high wages are offered for skilled men.

Pig Iron.—A number of small sales of bessemer, aggregating about 5,000 tons, were made during the week at prices ranging from $14 to $14.25, Valley furnaces, but most of it was at the latter figure. Some furnace interests will not accept less than $14.50, Valley, and that will likely be the minimum price in a short time. Several sales of small lots of foundry No. 2 were made within the past few days at $15.10@$15.35, Pittsburg, and gray forge is quoted at $14.50@$14.85, Pittsburg.

Steel.—Billets and sheet-bars continue firm and a number of important inquiries have been received, among them one from the Jones & Laughlin Steel Co. for 10,000 tons of billets for August delivery. The pool prices of $21 for billets and $23 for sheet-bars have been re-affirmed, but premiums ranging from $1.50 to $2 are asked. Plates are firm at 1.60c. and merchant steel bars at 1.50c.

Sheets.—There is but little change in the sheet market. Most of the independent mills and all of the union mills of the leading interest are still idle. Black sheets are quoted at 2.40c. and galvanized at 3.45c. for No. 28 gauge.

Ferro-Manganese.—There is no change in the market, domestic 80% still being quoted at $49@$50 per ton.

London. July 22.

Exports of iron and steel and of manufactures thereof, including machinery, are valued as below by the Board of Trade returns for the six months ended June 30:

	1904.	1905.	Changes.
Iron and Steel	£13,969,051	£14,966,605	I. £997,554
Machinery	10,301,813	11,000,016	I. 698,203
New ships	2,326,056	2,155,573	D. 170,483
Total	£26,596,920	£28,122,194	I. £1,525,274

Exports of mining machinery, included above, were valued at £439,333 in 1904, and £417,914 in 1905; a decrease of £21,419. The more important items were £127,314 to South Africa, a decrease of £83,621 from last year; and £57,763 to Australia and New Zealand, a large increase.

The leading items of the iron and steel exports for the six months were as follows, in long tons:

	1904.	1905.	Changes.
Pig iron	431,728	449,760	I. 18,032
Wrought iron	84,920	86,962	I. 2,042
Sheets	193,314	198,947	I. 5,633
Plates	74,632	80,057	I. 5,425
Rails	261,365	262,403	I. 1,038
Steel ingots, etc	58,202	69,986	I. 11,784
Tin-plates	172,134	186,109	I. 13,975
All other kinds	358,762	394,942	I. 36,180

The total increase in quantities was 104,109 tons, or 6.4%, as compared with last year.

Imports of iron and steel into Great Britain for the half-year were valued at £4,136,257 in 1904, and £4,002,495 in 1905; a decrease of £133,762. Imports of machinery were valued at £2,295,738 in 1904, and £2,454,694 in 1905; an increase of £158,956. The chief items of imports were, in long tons:

	1904.	1905.	Changes.
Pig iron	67,970	58,294	D. 9,676
Wrought iron	56,541	41,088	D. 15,453
Steel ingots, etc	271,544	283,959	I. 12,405
Structural steel	65,830	53,928	D. 11,902
All other kinds	198,620	195,584	D. 3,036

The total decrease in quantities was 27,651 tons, or 4.2%. Imports of iron ore were: Manganiferous, 138,524; other, 3,252,365; total, 3,390,889 tons, an increase of 367,662 tons, or 12%, over last year. Of the receipts this year, 2,803,422 tons were from Spain.

Cartagena, Spain. July 8.

Iron and Manganiferous Ores.—Messrs. Barrington & Holt report that the shipments were one cargo, 3,250 tons specular ore, and one cargo, 5,200 tons Calasparra magnetic, all to Rotterdam. The mining of both iron and manganiferous ores is very active in this sierra at present, and a good deal of ore has been sold for both prompt and forward delivery at rising prices. Freight rates appear slightly weaker than they were in June, some of the latest fixtures being Cartagena-Rotterdam, 5s. 6d. f. d.; Cartagena-Glasgow, 5s. 9d. f. d.

Quotations are unchanged: Ordinary 50% ore is 6s. 4d.@6s. 7d.; special low phosphorus, 6s. 10d.@7s. 6d.; specular ore, 58%, 9s. 6d.; S. P. Campanil, 9s. All prices are f. o. b. shipping port.

Pyrites.—Iron pyrites, 40% iron and 43% sulphur, are quoted at 10s. per ton.

Heavy Chemicals and Minerals.

NEW YORK, July 26.

(For other prices of chemicals and minerals, see large table on page 192.)

Acids.—The market continues even.

Boric, crystals	per lb.	.10
Powdered	"	.10½
Carbonic, liquid gas	"	.12½
Hydrofluoric, 30%	"	.03
44%	"	.05
60%	"	.11
Nitric acid, 36°, 100 lb		$4.75
38°, 100 lb		5.25
40°, 100 lb		5.50
42°, 100 lb		5.75
Oxalic acid, com'l, 100 lb		$5.00@ 5.25
Sulphuric acid, 50°, bulk, ton		13.50@14 50
60°, 100 lb. in carboys		1.05
60°, bulk, ton		18 00@20.00
66°, 100 lb. in carboys		1.20
66°, bulk, ton		21.00@23.00

Copper Sulphate.—Price remains at $4.80 for large lots, with slightly more for smaller quantities.

Sulphur and Pyrite.—Prime sulphur (both Louisiana and Sicilian) is quoted in New York, Boston and Portland at $20; in Philadelphia and Baltimore at $20.50. Pyrite continues unchanged at 10@11c. per unit of sulphur for lump ore, with 25c. additional for breaking to furnace size; 9.5@10c. for fines f. o. b. Atlantic ports. Domestic pyrite sells at 11c. per unit for furnace size, and 10c. for fines f. o. b. shipping point. Market even, with no stocks accumulated.

Nitrate of Soda.—Spot is quoted at $2.22½@$2.17½ for this year's; and at $2.07½@$2.12½ for next year. The market in general is the same, with freights firmer.

Exports of chemicals from Great Britain for the half-year ending June 30 are reported as follows, in cwts. of 112 pounds:

	1904.	1905.	Changes.
Copper sulphate	60.716	51,072	D. 9.644
Sulphuric acid	67,039	38 443	D. 28,596
Muriate of ammonia	37,222	42,536	I. 5,314
Soda ash	669,344	722,274	I. 52,930
Bicarb. soda	147,738	217,367	I. 69,629
Caustic soda	646,989	707,456	I. 60,467
Soda crystals	91,361	98,859	I. 7,498
Soda sulphate	476,868	278,811	D. 198,057

Imports of sulphur were 9,307 tons in 1904, and 9,676 tons in 1905, an increase of 369 tons. Imports of iron and copper pyrite, invoiced for its sulphur value, were 392,836 tons in 1904 and 369,984 tons in 1905, a decrease of 22,854 tons.

Sulphate of Ammonia.—Gas liquor is quoted at $3.10@$3.15 per 100 lb., with slightly less for large orders.

Phosphates.—Prices hold about the same, with a suggestion of strength, in anticipation of better foreign demand.

Phosphates.	F. o. b.	C. I. F. Gt. Britian or Europe.
*Fla., hard rock	$7.25@7.50	$10.67@11.85
land pebble	3.75@4.00	7.70@ 8.40
†Tenn., 78@80%	4.35@4.40	10.27@10.67
78%	3.75@4.00	.....
75%	3.40@3.50	.....
68@72%	3.00@3.25	.....
‡So. Car. land rock	3.75@4.00	.....
river rock	3.50@3.75	6.33@ 6.61
Algerian, 63@70%	.....	7.04@ 7.71
58@63%	.....	6.15@ 6.60
Tunis (Gafsa)	.....	6.00@ 6.60
Christmas Isle	.....	13.28@14.11
Ocean Isle	.....	13.60@14.45
Somme, Fr.	.....	11.39

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

Metal Market.

New York, July 26.

Gold and Silver Exports and Imports.

At all United States Ports in June and Year.

Metal.	June.		Year.	
	1904.	1905.	1904.	1905.
G'ld Exp	$1,522,544	$4,030,882	$68,449.393	$39,831,590
Imp	4,886,233	2,137,952	43,763,726	16,598,354
Exc	I. $3,363,689	I. $1,892,930	I. $20,685,667	E. 23,233,236
Silv. Exp	4,416,634	4,744.625	26.367,699	25,081,266
Imp	2,752,401	2,301,596	13,775,600	15,118,941
Exc	E. $1,658,233	E. $2,443,029	E. $12,592,099	$9.962,325

These exports and imports cover the totals at all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, N.Y.

For the week ending July 22, and for years from January 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$2,845	$143,632	$598,352	$224,231
1905	37,914,943	793,629	18,030,790	2,167,411
1904	63,727,202	3,590,419	23,056,479	479,435
1903	32,150,932	3,574,059	11,284,247	1,170,508

The silver exported for the week went chiefly to London; the gold to Santo Domingo. Imports, both of gold and silver, were from the West Indies, Mexico and South America.

General business is rather active, considering the season of the year, and prospects are encouraging.

The movement of gold in Great Britain for the six months ending June 30 is reported as follows:

	1904.	1905.
Imports	£17,110,448	£19,483,437
Exports	14,285,512	11,252,326
Excess, imports	£2,824,936	£8,231,111

The net imports showed an increase of £5,406,175 this year. The silver movement for the six months was as follows:

	1904.	1905.
Exports	£7,223,199	£6 991,675
Imports	6,946,798	6,627,711
Excess, exports	£276,401	£363.964

The net exports increased £87,563. Of the silver imported this year, £4,818,009, or 68.8% of the total, came from the United States.

The statement of the New York banks—including all the banks represented in the Clearing House—for the week ending July 22 gives the following totals, comparison being made with the corresponding week of 1904:

	1904.	1905.
Loans and discounts	$1,099,849,200	$1,126.366,700
Deposits	1,201,443,200	1,177,398,200
Circulation	39,132,600	48,913,200
Specie	265,955,400	220,190,500
Legal tenders	85 015,000	89,109,000
Total reserve	$350,970,400	$309,299,500
Legal requirements	300,360,800	294,349,550
Balance surplus	$50,609,600	$14,949,950

Changes for the week this year were increases of $19,058,600 in loans, $28,400 in specie and $18,380,000 in deposits; decreases of $4,573,300 in surplus reserve, $6,700 in legal tenders and $243,800 in circulation.

The following table shows the specie holdings of the leading banks of the world. The amounts are reduced to dollars:

	Gold.	Silver.
New York Associated	$220,190,200	.....
England	191,378,210	.....
France	584,645,940	$221,887,230
Germany	182,635,000	60,880,000
Spain	74,325,000	111,520,000
Netherlands	31,909,000	30,977,500
Belgium	15,876,665	7,938,335
Italy	113,930,000	17,386,000
Russia	547,290,000	30,070,000
Austria	234,185,000	63,780,000

The returns of the Associated Banks of New York are of date July 22 and the others July 20. The foreign bank statements are from the *Commercial and Financial Chronicle*, of New York.

Shipments of silver from London to the East for the year up to July 13 are reported by Messrs. Pixley & Abell, as follows:

	1904.	1905.	Changes.
India	£5,468,038	£3,873.941	D. £1,594,097
China	368,489	687,770	I. 319,281
Straits	58,103	2,800	D. 55,303
Totals	£5,894,630	£4,564,511	D. £1,330,119

Imports for the week were £174,000 from New York and £4,000 from the West Indies; a total of £178,000. Exports were £84,200 to India, £49,400 to China and £1.200 to Egypt; making £134,800 in all.

Indian exchange is stronger and the Council bills offered in London brought an average of 16.03d. per rupee, although the amount offered was increased from 40 to 60 lakhs of rupees. Buying of silver for India was light, but considerable amounts were taken for Continental account, probably for Russia.

Silver continues steady on London buying for the India mint. Fluctuations have been very small indeed.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars	$0.45½	$0.47½
Peruvian soles and Chilean pesos	.42	.45
Victoria sovereigns	4.86	4.87½
Twenty francs	3.87	3.90
Spanish 25 pesetas	4.78	4.82

SILVER AND STERLING EXCHANGE.

July.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	July.	Sterling Exchange.	Silver. New York. Cents.	Silver. London, Pence.
20	4.86½	59 1/16	27 1/4	24	4.86¼	59	27 1/4
21	4.86¼	58 7/8	27 3/16	25	4.86¼	58 7/8	27 3/16
22	4.86¼	58 7/8	27 3/16	26	4.86¼	58 7/8	27 3/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, .925 fine

Other Metals.

Daily Prices of Metals in New York.

July.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
20	15 @15⅛	14 7/8 @15	67 5/8	32	4.50	5.50	5.35
21	15 @15⅛	14 7/8 @15	67 5/8	32	4.50	5.50	5.35
22	15 @15⅛	14 7/8 @15	....	32	4.50	5.50	5.35
24	15 @15⅛	14 7/8 @15	67¾	32¾	4.50	5.50	5.35
25	15 @15⅛	14 7/8 @15	67 7/8	33	4.60	5.50	5.35
26	15 @15⅛	14 7/8 @15	67 7/8	33 @33¼	4.60	5.50	5.35

London quotations are per long ton (2,240 lb.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars. Cathodes are usually 0.25c. below the price of electrolytic copper.

Copper.—There has been no change in the tone of the market during the past week. Business continues active both for home trade and export, and consumption the world over is on a very large scale. Prices have held firm at 15@15⅛c. for lake; 14⅞@15c. for electrolytic in cakes, wirebars or ingots; 14⅝@14¾c. for cathodes and 14½@14⅝c. for casting copper.

The standard market has displayed considerable strength, and closes firm at £67 17s. 6d. for spot and £68 for futures. Prices now ruling for this description are more in conformity with the refined grades than for some months past.

Refined and manufactured sorts we quote as follows: English tough, £69@£69 10s.; best selected, £71 15s.; strong sheets, £78 10s.; India sheets, £74 10s.; yellow metal, 6½d.

There is every indication that copper is wel sold ahead, and that there are no surplus stocks to draw upon, beyond the usual and normal quantities. This condition exists, notwithstanding the increase in production this year, which, undoubtedly, has been considerable. The consumption at present is large in almost all quarters, and the foreign demand has been steady. In addition to this, the unusual exports to China must be taken into consideration, in all comparisons.

Our special correspondent reports that the exports from Baltimore for the week were 1,154 long tons of fine copper.

Imports of copper and copper material into Great Britain, with exports of the metal, for the six months ending June 30, are reported as below in long tons; the totals giving the contents of all material, in fine copper:

	1904.	1905.	Changes
Copper ore	38,024	43,056	I. 5,032
Matte and precipitate	30,131	30,618	I. 487
Fine copper	43,300	36,094	D. 7,206
Total imp., fine cop.	62,168	55,709	D. 6,459
Exports	8,425	3,108	D. 5,317
Balance, imports	53,743	52,601	D. 1,142

Of the imports this year, the United States furnished 48 tons of ore, 2,095 tons of matte and 15,933 tons of fine copper; against 21 tons of ore, 2,899 tons of matte and 22,459 tons of fine copper last year.

Tin.—The further reduction in the Banka sales, which were announced from London during the week, has had an immediate effect on prices, which have jumped by leaps and bounds, and close firm at £150 10s. for spot and £149 7s. 6d. for three months. Domestic consumers have been compelled to enter the market more freely, and a good business took place at advancing quotations, the closing quotations ruling at 33@33¼c.

Imports of tin into Great Britain, with re-exports of imported metal for the six months ending June 30 are reported as below, in long tons:

	1904.	1905.	Changes.
Straits	14,201	15,482	I. 1,281
Australia	1,941	1,728	D. 213
Other countries	1,407	638	D. 769
Total imports	17,549	17,848	I. 299
Re-exports	13,230	13,332	I. 102
Net imports	4,319	4,516	I. 197

A large part of the re-exports consists of Straits tin sent to the United States. A considerable part of the tin reported from other countries is Bolivian tin.

Lead.—On July 25, the American Smelting & Refining Co. advanced its price $2 a ton, thus making quotations 4.52½ St. Louis, 4.60 New York. It is reported that the supplies on hand are very low, while consumption is unprecedentedly large.

The London market for lead has not been an exception to the general rule, in so far as we have to note an advance in the quotations to £14 for Spanish and £14 2s. 6d. for English. Spot supplies in London are ruling at a premium.

Imports and exports of lead in Great Britain for the six months ending June 30 are reported as follows, in long tons:

	1904.	1905.	Changes.
United States	17,204	12,950	D. 4,254
Spain	50,116	50,346	D. 70
Australia	35,782	39,631	I. 3,849
Germany	10,119	8,021	D. 2,098
Other countries	11,284	1,229	D. 10,055
Total imports	124,605	111,977	D. 12,628
Exports	18,397	20,879	I. 2,482
Balance, imports	106,208	91,098	D. 15.110

The lead credited to the United States is chiefly Mexican lead, refined here in bond.

St. Louis Lead Market.—The John Wahl Commission Co. telegraphs us as follows: Lead is strong and higher. Sales are at 4.52½c. for desilverized lead, and 4.60@4.62½c. for Missouri brands.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of July 8, that silver has been 14.25 reales per oz. Exchange is 33.19 pesetas to £1. Local price for pig lead is 72.25 reales per quintal, which, on current exchange is equal to £12 3s. 7d. per long ton, f. o. b. Cartagena. Shipments for the week were 1,033 tons argentiferous lead to London; 65 tons desilverized to Marseilles; 300 tons desilverized bars to Amsterdam.

Spelter.—The consumption has broadened at a material rate. The stocks in the hands of producers have been very much reduced. As a result, higher prices have been asked and realized. Quotations at the close are 5.35c. St. Louis and 5.50c. New York.

The London market has been somewhat reactionary, the closing quotations being £23 15s. for ordinaries and £24 for special brands.

Imports and exports of spelter in Great Britain for the six months ending June 30 are reported as follows, in long tons:

	1904.	1905.	Changes.
Spelter	44,415	42,215	D. 2,200
Zinc sheets, etc.	11,626	9,851	D. 1,775
Total imports	56,041	52,066	D. 3,975
Exports	3,616	3,869	I. 253
Balance, imports	52,425	48,197	D. 4,228

There was a decrease in all forms of imports. Zinc ore is not reported separately.

St. Louis Spelter Market.—The John Wahl Commission Co. telegraphs us as follows: Spelter is strong and largely higher. The latest sales are on a basis of 5.40c., East St. Louis.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of July 8, that prices are nominally unchanged at 75 fr. for blende, 35% zinc, and 55 fr. for calamine, 30% zinc. Just at present, the output exceeds demand. Shipments for the week were 2,700 tons blende to Antwerp.

Antimony.—There has been no change in the market, which remains firm at 12½ to 13c., depending upon the brands and deliveries.

Nickel.—The large producers quote nickel at 40@47c. per lb. for lots of one ton or over, according to size and conditions of order. For small quantities as high as 60c. is named.

Platinum.—Quotations are firm at $20.50 per oz. Gas-engine sparking points vary from 87c. for "A," to $1.80 for "B."

Platinum in manufactured forms is strong. Messrs. Eimer & Amend, of New York, quote for different forms as follows: Heavy sheet and rod, 75c. per gram; foil and wire, 80c.; crucibles and dishes, 85c.; perforated ware, 90c.; and cones, $1 per gram.

Quicksilver.—Quicksilver is a little easier, selling at $41 per flask—75 lb.—for large orders; while small quantities bring $41.50. San Francisco prices are unchanged, $39 being asked for domestic orders. Export business can be placed at $37.50@$38 per flask. The London price is steady at £7 7s. 6d. per flask, from both first hands and jobbers.

Imports of quicksilver into Great Britain for the six months ending June 30 were 2,348,048 lb. in 1904, and 2,465,768 lb. in 1905; an increase of 117,720 lb. Re-exports of imported quicksilver were 821,421 lb. in 1904, and 923,535 lb. in 1905; an increase of 102,114 lb. this year.

Manganese Alloys.—Prices for manganese alloys in Germany are given by Paul Speier as below. The prices are for orders of not less than 500 kg., delivered in Bremen, and are as follows, per 100 kilograms:

	Marks.
Manganese Copper, No. 1, 30% Mn	265
No. 2, 28% Mn	175
No. 3, 20 to 25%	165
Manganese Tin, No. 1, 55% Mn., no iron	365
No. 2, 55% Mn., some iron	225
Manganese Nickel, No. 1, free of iron	450
No. 2, traces of iron	270

Manganese metal is quoted at 3.60 marks per kg.—38.8c. per lb.—delivered in Bremen.

Minor Metals.—For minor metals and their alloys, wholesale prices are f.o.b. works:

Aluminum.	Per lb.
No. 1 90,% ingots	33@37c.
No. 2, 99% ingots	31@34c.
Rolled Sheets	4c. up.
Aluminum-Bronze	20@23c.
Nickel-alum	33@39c.
Bismuth	$2.10
Cadmium, f. o. b. Hamburg	77c
Chromium, pure (N. Y.)	80c.
Copper, red oxide	50c.
Ferro-Molybdenum (50%)	$1.00
Ferro-Titanium (20@25% N. Y.)	75c.
Ferro-Chrom. (74%)	12½c.
Ferro-Tungsten (37%)	45c.
Magnesum, pure (N. Y.)	$1.60
Manganese (98@99% N. Y.)	75c.
Manganese Cu. (30@70% N. Y.)	40c.
Molybdenum (98@99% N. Y.)	$2.75
Tantalic acid (N. Y.)	50c.
Thallium, f. o. b. Breslau, Germany	65@70c.
Phosphorus, foreign	45c.
Phosphorus, American	70c.
Tungsten (best)	$1.25

Variations in prices depend chiefly upon the size and conditions of orders.

Missouri Ore Market.

JOPLIN, July 22.

The highest price reported paid for zinc was $48.50 per ton for two bins of Joplin zinc, and the assay basis ranged from $42 to $45, a general advance on all grades of $1 per ton over the previous week, and $4.50 per ton in four weeks. Lead prices are unchanged at $61 for choice ore and $60 for 80% grades.

The entire camp of Badger was inundated by the high water of Spring river on Thursday, and a few other mines were covered several feet over the top by the vast blanket of water that flooded the river and creek valleys, while the inflow of water through the ground was greatly augmented by two days of heavy and incessant rain. Inestimable damage was done not alone to the mines directly, but in the additional cost involved in reclaiming the mines from the water, and in the loss of ore sales. One smelter representative gives it as a conservative figure that the output will be restricted 6,000 tons in the following six weeks, or approximately a loss of $260,000 alone in ore shipment, in addition to the added cost of drainage and direct damage to mines and machinery. One mill is reported caved in and others so badly twisted by the waters that little short of re-building will suffice to restore them to usefulness; big and little producing mines are damaged by caving and sliding earth in all parts of the district. In Webb City and Carterville the deep mines on the lands of the Missouri Zinc Fields and the Center Creek Mining Co. are heavily burdened with the inflowing water, the large steam pumps are covered, and it is feared that before they can be uncovered other lands adjoining will be seriously handicapped. All the mines of that camp will be affected to a degree that cannot at this time be foretold.

Following are the shipments of zinc and lead from the various camps of the district for the week:

	Zinc, lb.	Lead, lb.	Value.
Joplin	2,898,330	263,660	$74,570
Carterville-Webb City	2,220,900	496,910	64 880
Duenweg	1,162,790	147,040	30,570
Galena-Empire	613,580	.....	13,500
Neck City	620,600	.....	14,270
Aurora	392,600	.....	7,950
Granby	475,000	37,000	7,100
Alba	301,970	.....	6,845
Badger	281,460	.....	6,470
Prosperity	174 700	71,800	6,080
Carthage	156,570	.....	3,600
Oronogo	178,530	14,390	3,370
Spurgeon	138,610	22,640	2,730
Reeds	53,780	.....	1,180
Baxter Springs	60,410	.....	1,050
Beef Branch	73,620	8,610	980
Totals	9,803,550	1,062,050	$245,245
29 weeks	278,386,200	33,406,290	$7,144,410

Zinc value, the week, $213,445; 29 weeks, $6,183,345.
Lead value, the week, $ 31,800; 29 weeks, $960,975.

The average price of the zinc ore sold for the week was $43.54; for the 29 weeks, $44.42. The average price of lead ore for the week was $59.89; for the 29 weeks, $57.53 per ton.

Mining Stocks.

New York. July 26.

Trading in stocks has been rather quiet during the week. Such speculation as there was going was chiefly in the grain and cotton markets. Amalgamted Copper gained very little on the increased dividend, closing at $83. In the industrials, United States Steel was off a little, but the changes were not important.

In the curb market an effort was made to work up some of the copper stocks, but the results were not striking. In other mining stocks there was no movement worth noting.

Boston. July 25.

It was remarked last week that it begins to look as if there might be a boom in copper-mining shares. This has been made good, and the whole list has a better appearance than has been witnessed for two years. The movement has been a healthy one, with no kiting of stocks. Prices are up from $1 to $20, the latter in the case of Calumet & Hecla. Of course the movement has been stimulated by the strong market in New York, but there is every reason to believe that the market will maintain its equilibrium and eventually even higher prices will be seen. The foundation for this movement is good, as the producing companies are now getting the benefit of the 15c. copper market, and if good judges count, they will continue to for some time. The movement has been gradually growing and the most skeptical admit its genuineness.

Calumet & Hecla is up $20 to $665. The annual report for the year ended April 30, 1905, was issued last week.

Osceola mining is up $7 for the week to $100, and Quincy has risen $3 to $108. Some disappointment was felt because the Quincy did not increase its semi-annual dividend beyond $3. United Copper spurted to $31.75, but more or less of it has been wash sales. United States has also been well to the front, rising $1.62½ to $33.50. Utah, although not so active, rose $1.25 to $45. Copper Range rose $4,25 to $74.75, reacting to $73. President Paine expects this proposition to produce between 43,000,000 and 45,000,000 lb. of copper the current year, with between 8,000,000 and 9,000,000 lb. of this to the St. Mary's Co., as it owns one-half the Champion. The St. Mary's Co. has declared another $1 dividend.

Atlantic has been in good demand, largely from the Lake district. From a close at $15.50 a week ago, it touched $18.50 today. Greene is up $1.37½ to $23.25.

Colorado Springs. July 21.

The market in Cripple Creek shares shows little changes in prices or volume of trading. It is reported today that one of the richest strikes ever reported in the district was made on the Hull City mine.

El Paso has remained practically at the same price, selling today for $1.25; Portland is selling at $2.25. The last sale of Findley was at 61½c. Isabella remains close to 28c. Gold Sovereign sold today for 9½c.; Independence at 10c.; United Gold Mines at 15½c. per share.

At the meeting of the directors of the Colorado Springs Mining Exchange, F. F. Castello was elected president; J. A. Hayes, first vice-president; J. R. McKinnie, second vice-president; J. Arthur Connell, third vice-president; W. P. Kinney, secretary and treasurer.

San Francisco. July 20.

The Comstock shares are easier. Ophir was up above $7 early in the week, but is now down to $6.75, and nearly all the rest followed this lead. There is really nothing new, and the market is mainly a professional one. The public, however, is still taking an interest in the Tonopah and Goldfield stocks. Buying orders come in well, and trading has been active.

In oil stocks there has been very little done, and business is almost at a stand.

St. Louis- July 25.

Prices of stocks show little change. For the lead companies' shares bid and asked prices are as follows: Center Creek, $1.50—$2; Central Lead, $150—$155; Columbia, 25c.—$1; Doe Run, $118—$120; St. Joe, $15—$16.75. For coal stocks, bid and asked prices are recorded as follows: Central Coal & Coke common, $63.75—$64, and preferred, $78—$79; Consolidation Coal, $30—$31. For other mining stocks quotations are: American Nettie, 10c.—25c.; Granite Bimetallic, 37c.—45c. per share.

Dividends

Company.	Payable.	Rate.	Amount.
Alaska Mexican	July 28	.30	54,000
Alaska Treadwell	July 28	1.00	200,000
Amalgamated Copper	Aug. 28	1.25	1,933,750
†Boston & Montana	July 20	10.00	1,500,000
Bunker Hill & Sullivan	July 5	.50	150,000
Cambria Steel Co.	Aug. 15	.75	675,000
†Dillon Gold		.01	12.500
Hunt. & Broad Top, pfd.	July 26	1.50	60,000
Jerry Johnson		.01	25,000
Osceola	July 25	2.00	192,300
Tamarack	July 29	2.00	120,000
‡Tennessee C. & I., pfd.	Aug 1	2.00	4,960
†Tennessee C., I. & R., com.	Aug. 1	1.00	225,536
United Copper	July 31	1.00	450,000
Vindicator		.001	44,000

*Monthly. §Bi-monthly. †Quarterly. ‡Semi-Annually.

LONDON. (*By Cable.**) July 25.

	£	s.	d.
Camp Bird	1	14	9
Consolidated Gold Fields	6	6	3
De Beers	16	12	6
Dolores	1	9	0
East Rand	7	10	0
El Oro	1	1	3
Esperanza	2	1	9
Modderfontein	9	0	0
Rand Mines	9	3	9
Rio Tinto	65	15	0
Simmer and Jack	1	11	10½
Tomboy	1	2	6

*Furnished by Wm. P. Boubright & Co., New York.

STOCK QUOTATIONS.

NEW YORK. Week July 25.

Name of Company.	High	Low	Clg.	Sales
Amalgamated	84⅜	81⅞	83½	228,725
Anaconda	110	108	108½	7,400
Arizona Consolidated	30⅜	30	30½	1,700
British Col. Copper	7⅜	6¾	6½	3,715
Federal Min. & Smelt.	105	100	105	1,000
Federal Preferred	92	90	92	1,500
Greene Copper	24	21⅞	22⅜	16,750
Greene Gold	5	3½	4⅜	13,200
Mitchell	6½	5⅜	5⅞	7,050
Tennessee Copper	31⅜	30½	31	1,100
Union Copper	1 15/16	1 7/8	1⅞	27,600
United Copper,	33	29⅜	30⅜	42,800
United Copper, Pref.	75	72⅜	74½	3,113

NEW YORK INDUSTRIALS.

Am. Smelting & Ref.	117⅜	115½	116	15,560
Am. Smelting & Ref., Pf.	120	119½	119½	500
Colorado Fuel & Iron	46⅞	43½	44	12,300
National Lead	45	43⅜	43⅞	500
National Lead, Pf.	105½	105½	105½	400
Pittsburg Coal	13½	12½	13	1,900
Pittsburg Coal, Pf.	51	46	46	3,250
Republic I. & S.	21½	19⅜	20	12,000
Republic I. & S., Pf.	83½	81¾	82	16,900
Tenn. Coal & Iron	87⅞	85	85½	16,600
U. S. Red. & Ref., Pf.	67	66	66	1,820
U. S. Steel	34⅞	32⅝	33⅝	165,980
U. S. Steel, Pf.	102⅞	100⅝	101⅜	120,605
Bethlehem Steel	31½	31½	31½	300
*Bethlehem Steel, Pf.	88	87	87½	610
Standard Oil	618	615	615	137

BOSTON.

Allouez	28½	27½	27¾	1,542
Amalgamated	84¼	82	83¼	14,098
Atlantic	18¾	15½	17½	2,899
Bingham	31¼	29½	30¾	7,583
Boston Consolidated	8¼	8⅛	8⅛	4,825
Calumet & Hecla	665	648	660	150
†Centennial	23½	21¼	22¼	7,726
Mercur	.58	.55	.58	625
Copper Range	74¾	70½	71	24,380
Daly-West	14¼	14	14	560
Elm River	2⅜	2¼	2⅝	450
Franklin	11	10	10	557
Granby	6⅞	6¼	6⅝	4,690
Green Con. Copper	24	22	22¾	7,816
Guanajuato	4½	4¼	4¼	730
Isle Royale	24½	22	24	5,283
‡Mass	9½	8⅛	9	4,392
Michigan	14⅞	14¼	14¼	5,870
Mohawk	54	51	52¾	3,027
Old Dominion	27¾	26	27	5,050
*Osceola	100	93¾	99	4,636
Parrot	25½	24	25⅛	3,170
Phoenix	.65	.60	.60	132
Quincy	109	107	107	271
Shannon	7¾	7⅛	7¼	3,870
*Tamarack	127	120	123	410
Tecumseh	4⅛	4	4⅛	1,714
United Copper, com	32¾	29	30⅝	16,780
*§United States	33⅞	31¾	32½	13,109
United States Coal & Oil	10¾	10	10½	1,665
*Utah	45	43½	44½	5,738
Winona	118	116¼	117½	224
Wolverine	12¾	11	12⅛	2,820

*Ex-dividend. †1st Instalment Paid.
‡Assessment Paid. §Ex. Rights.

BALTIMORE.

Alabama C. & I.	94	94	94	20
Consolidation Coal				
Georges Creek C. & I.				

PHILADELPHIA.

Cambria Steel	27½	27⅛	27⅛	587
Pennsylvania Salt	107	106½	107	15
Philadelphia Co.	48⅜	43	43¼	950
Tonopah	13¾	12⅛	13½	1,750

PITTSBURG.

Crucible Steel	11	10⅜	10⅜	598
Crucible Steel, Pref.	62¾	62	62	399
O. Tonopah	36	34	34	31,845

COLORADO SPRINGS.

Name of Company.	First	High	Low	Clg.
Elkton	41	43	40	40
El Paso	125	129½	125	127
Isabella	28⅝	29½	28⅝	29
Portland	210	225	210	210
Vindicator	79	90	79	80

SAN FRANCISCO.

Best & Belcher	1.25	1.25	1.15	1.15
Bullion	.40	.40	.40	.40
Caledonia	.44	.44	.42	.42
Confidence	.82	.88	.80	.88
Con. Cal. & Va	1.35	1.35	1.35	1.35
Gould & Curry	.19	.19	.17	.17
Hale & Norcross	2.00	2.00	1.80	1.90
Mexican	1.30	1.30	1.25	1.25
Occidental Con	.88	.88	.88	.88
Ophir	6.87½	6.87½	6.50	6.50
Savage	.70	.70	.64	.68
Sierra Nevada	.26	.26	.26	.26

Monthly Average Prices of Metals.

SILVER.

Month.	New York.		London.	
	1904.	1905.	1904.	1905.
January	57.005	60.690	26.423	27.930
February	57.592	61.023	26.665	28.047
March	56.741	58.046	26.164	26.794
April	54.202	56.600	24.974	26.108
May	55.430	57.832	25.578	26.664
June	55.673	58.428	25.644	26.910
July	58.095	.....	26.760	.....
August	57.806	.....	26.591	.....
September	57.120	.....	26.349	.....
October	57.923	.....	26.760	.....
November	58.453	.....	26.952	.....
December	60.563	.....	27.930	.....
Year	57.221	.....	26.399	.....

The New York prices are in cents per fine ounce; the London quotation is in pence per standard ounce, .925 fine.

COPPER.

	New York. Electrolytic.		New York. Lake.		London.	
	1904.	1905.	1904.	1905.	1904.	1905.
Jan.	12.410	15 008	12 553	15.128	57.500	68.262
Feb.	12.063	15.011	12.245	15.136	56.500	67.963
March	12.299	15.125	12.551	15.250	57.321	68.174
April	12.923	14.920	13.120	15.045	58.247	67.017
May	12.758	14.627	13.000	14.820	57.321	64.875
June	12.269	14.673	12.399	14.813	56.398	65.881
July	12.380	.....	12.505	.....	57.256	.....
Aug.	12.343	.	12.468	.....	56.952	.....
Sept.	12.495	.....	12.620	.....	57.645	.
Oct	12.993	.....	13.118	.....	60.012	.....
Nov.	14.284	.....	14.456	.....	65.085	.....
Dec.	14.661	.....	14.849	.....	66.384	.....
Year	12.823	.....	12.990	.....	58.587	.....

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars; cathodes are usually 0.25c lower. The London prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan.	28.845	29.325	July	26.573	.....
Feb.	28.087	29.262	August	27.012	.....
Mar.	28.317	29.523	Sept.	27.780	.....
April	28.132	30.525	Oct	28.596	.....
May	27.718	30.049	Nov.	29.185	.....
June	26.325	30.329	Dec.	29.286	.....
			Av., year.	27.986	.....

Prices are in cents per pound.

LEAD IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan.	4.347	4.552	July	4.192	.....
Feb.	4.375	4.450	Aug.	4.111	.....
Mar.	4.475	4.470	Sept.	4.200	.....
April	4.475	4.500	Oct	4.200	.....
May	4.423	4.500	Nov.	4.200	.....
June	4.496	4.500	Dec.	4.600	.....
			Av., year.	4.309	.....

Prices are in cents per pound.

SPELTER.

Month.	New York.		St. Louis.		L'nd'n
	1904.	1905.	1904.	1905.	1905.
January	4.863	6.190	4.673	6.032	25.063
February	4.916	6.139	4.717	5.989	24.594
March	5.057	6.067	4.841	5.917	23.825
April	5.219	5.817	5.038	5.667	23.813
May	5.031	5.434	4.853	5.284	23.594
June	4.760	5.190	4.596	5.040	23.875
July	4.873	.....	4.723	.....	.....
August	4.866	.....	4.716	.....	.....
September	5.046	.....	4.896	.....	.....
October	5.181	.....	5.033	.....	.....
November	5.513	.....	5.363	.....	.....
December	5.872	.....	5.720	.....	.....
Year	5.100	.....	4.931	.....	.....

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2,240 lb.) good ordinary brands.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

(See also Market Reviews.)

ABRASIVES—		
Bort as to size	carat	$10.00@$18.00
Carborundum, f.o.b. Niagara Falls, powd	lb.	.08
Grains	"	.10
Corundum, N. C.	"	.07@.10
Chester, Mass.	"	.04½@.05
Craigmont, Ont.	"	.05½@.06½
Mont. f.o.b. Chicago	"	.07@.07½
Crushed Steel, f.o.b. Pittsburg	"	.05½
Emery, in kegs: Turkish flour	"	.03½
Grains	"	.05@.05½
Naxos flour	"	.03½
Grains	"	.05@.05½
Chester flour	"	.03½
Grains	"	.05@.05½
Peekskill, f.o.b. Easton, Pa., flour	"	.01½
Grains, in kegs	"	.02½
Garnet, per quality	sh ton	25.00@35.00
Pumice Stone, Am. Powd.	lb.	.01 3-5@.02
Italian, powdered	"	.01½@.01⅝
Lump, per quality	"	.04
Rottenstone, ground	"	.02½@.04½
Lump, per quality	"	.06@.20
Rouge, per quality	"	.10@.30
Steel Emery, f.o.b. Pittsburg	"	.07
ALCOHOL—Grain	gal.	2.38
Refined wood, 95@97%	"	.70@.75
Purified	"	1.25@1.30
ALUM—Lump	100 lb.	1.75
Ground	"	1.85
ALUMINUM—Sulphate, com'l.	"	75@1.25
AMMONIUM—		
Bromide	lb.	.22
Carbonate	"	.08
Muriate grain	"	.05½@.05⅝
Lump	"	.09⅛
ARSENIC—White	"	.02½@.03
Red	"	.06¾@.06⅞
ASPHALTUM—		
Barbadoes	"	.02½@.03
Cuban	"	.01½@.03½
Egyptian, crude	"	.06@.07
Gilsonite, Utah ordinary	"	.03@.03½
Trinidad	"	35.00
BARIUM—		
Carb. Lump, 80@90%	sh. ton.	25.00@27.00
92@98%	"	28.00@29.00
Powdered 80@90%	lb.	.01½@.02
Chloride com'l	100 lb.	1.35@1.50
Chem. pure cryst	lb.	.05
Nitrite, powdered	"	.05
Sulphate (Blanc Fixe)	"	.02
BARYTES—		
Am. Crude No 1	sh. ton.	9.75
Crude No. 2	"	8.00
Crude No. 3	"	7.00
Floated	"	16.75@18.00
Foreign floated	"	18.75@20.50
Snow-white	"	17.25@18.75
BAUXITE—Ga. or Ala. Mines:		
First grade	lg. ton.	5.25@5.50
Second grade	"	4.50@4.75
Arkansas, first grade	lg. "	5 00@5.50
Second grade	"	4.50@4.75
Washed ore	"	6.00@7.00
BONE ASH	100 lb.	.02½@.02½
BORAX	"	.07½@.07½
CADMIUM—Metallic	"	1.40
CALCIUM—Acetate, gray	"	2.30
Acetate, brown	"	1.55
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J.	sh. ton.	65.00
Chloride, f.o.b. works	"	9.00@10.00
CEMENT—		
Portland, Am. 400 lb.	bbl.	.90@1.25
Foreign	"	1.25@1.75
"Rosendale," 300 lb.	"	.80
Slag cement	"	.75@1.25
CHLORINE—Liquid		.30
Water		.10
CHROME ORE—		
(50%) ex-ship N. Y.	lg. ton.	18.50@19.00
Bricks, f.o.b. Pittsburg, M.	"	175.00
CLAY, CHINA—Am. common ex-dock, N. Y.	"	7.75@8.00
Am. best ex-dock, N. Y.	"	9.00@9.25
English, common	"	11.00@11.25
Best	"	16.75
COPPERAS—Bulk	100 lb.	$0.47½
In bbls	"	.52½
CRYOLITE	lb.	.06½
EXPLOSIVES—		
Blasting powder, A	.25-lb. keg	.65
Blasting powder, B	"	1.40
"Rackarock," A	lb.	.25
"Rackarock," B	"	.18
Judson R.R. powder	"	.10
Dynamite (20% nitro-glycerine)	"	.13
(30% nitro-glycerine)	"	.14
(40% nitro-glycerine)	"	.15
(50% nitro-glycerine)	"	.16½
(60% nitro-glycerine)	"	.18
(75% nitro-glycerine)	"	.21
Glycerine for nitro	"	.11@.11½
FELDSPAR—Ground	sh. ton.	9.75@10.00
FLUORSPAR—		
Domestic f.o.b. shipping port:		
Lump	sh. ton.	8.00@10.00
Ground	"	11.50@13.50
Gravel	"	4.25@4.50
FULLER'S EARTH—Lump	100 lb.	.80
Powdered	"	.85
GRAPHITE—		
Am. pulverized	"	45.00
Best flake	"	150.00
Ceylon, common pulv	"	.02½@.03½
Best, pulverized	"	.04@.08
German, com. pulv	"	.01½@.01½
Best, pulverized	"	.01½@.02
Italian, pulverized	"	.01½
GYPSUM—Ground	sh. ton.	8.00@8.50
Fertilizer	"	7.00
Rock	lg. ton.	4.00
English and French	"	14.00@16.00
INFUSORIAL EARTH—		
Ground Am. best	"	20.00
French	"	37.50
German	"	40.00
LEAD—Acetate, white	lb.	.09@.09½
Brown	"	.07@.07½
Nitrate, com'l	"	.06½
" granular	"	.08½
MAGNESITE—Greece.		
Crude (95%)	lg. ton.	6.50@7.00
Calcined	sh. ton.	16.50@17.00
Bricks, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	lb.	.01½
Sulphate	100 lb.	.50@1.25
MANGANESE—		
Crude powdered:		
70@75% binoxide	lb.	.01½@.01½
75@85% binoxide	"	.01½@.02½
85@90% binoxide	"	.02½@.03½
90@95% binoxide	"	.03½@.05½
Ore	unit.	.18@.20
MARBLE—Flour	sh. ton.	6.00@7.00
MINERAL WOOL—		
Slag, ordinary	"	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
Selected	"	40.00
OZOKERITE	lb.	11½
PAINTS AND COLORS—		
Litharge, Am. powdered	"	.05½@.06½
English glassmakers'	"	.08½@.08¾
Lithophone	"	.03½@.06½
Metallic, brown	sh. ton.	19.00
Red	"	16.00
Ocher, Am. common	"	8.50@9.00
Best	"	16.00
Dutch, washed	lb.	.02½
French, washed	"	.01½@.01⅞
Paris green, pure, bulk	"	.12
Red lead American	"	.06½@.06½
Foreign	"	.07@.08
Turpentine, spirits	gal.	.64
White lead, Am., dry	lb.	.05½@.05½
American, in oil	"	.06½@.06½
Foreign, in oil	"	.09@.09½
Zinc white, Am. extra dry	"	.04½@.04½
Foreign, red seal, dry	"	.06@.08½
Green seal, dry	"	.06½@.09½
POTASSIUM—		
Bicarbonate crystal	lb.	$0 08½
Powdered or granulated	"	.14
Bichromate, Am.	"	.08½@.084
Scotch	"	.08⅝@.08¾
Bromide	"	.15
Carbonate (80@85%	"	3.50@4.00
Caustic, ordinary	"	.04½
Elect. (90%)	"	.06½
Chlorate, powdered	"	.08½@.08½
Crystals	"	.08½@.08½
Cyanide (98@99%)	"	.18@.19
Kainit (bulk)	lg. ton.	8.50
Manure salt 20%	"	14.75@15.75
Double Manure Salt, 48@53%	100 lb.	1.16½@1.19½
Muriate	"	1.90@1.95
Permanganate	lb.	.09½@.09⅝
Prussiate, yellow	"	.13½@.13½
Red	"	.35
Sulphate	100 lb.	2.18½@2.21½
SALT—N. Y. com. fine 280 lb. bbl.		.72@1.18
N. Y. agricultural	sh. ton.	4.40
SALTPETER—Crude	100 lb.	4.00@4.25
Refined	"	4.25@4.75
SILICA—		
Ground quartz, ord'ry	sh. ton	9.00@10.00
Best	"	12.00@13.00
Lump Quartz	"	2.50@4.00
Glass sand	"	2.75
SILVER—Nitrate, crystals	oz.	.36½
SODIUM—		
Acetate	lb.	0.04½
Bicarb., ord., bulk, f.o.b. works	100 lb.	1.30
Extra domes, f.o.b. works	"	3.50
Bichromate	lb.	.06½
Bromide	"	.20
Carbonated ash, high test, in bags, f.o.b., works	100 lb.	.75@.77½
Foreign, f.o.b. N. Y.	"	.85@.87½
Caustic, 60@78%, f.o.b., works	"	1.75@1.85
Foreign, f.o.b. N. Y.	"	1.90@1.95
Chlorate, com'l	"	.08½@.08½
Hyposulphite, Am.	"	1.50@1.60
German	"	1.75@2.00
Phosphate	lb.	.02½@.02½
Prussiate	"	.09½@.09½
Sal soda, f.o.b. works	100 lb.	.60
Foreign, f.o.b. N. Y.	"	.85
Silicate, concentrated	lb.	.05
Com'l	"	.01
Sulphate, com'l	100 lb.	.65
SULPHUR—Best seconds, per ton,		21.00
Roll	lb.	1.85
Flour	"	1.90
Flowers, sublimed	"	2.20
TALC—North Carolina	sh. ton.	15.50@23.50
N. Y. Fibrous best	"	10.25
French, best	"	20.00
Italian, best	"	30.00
TAR—Oil bbl. (50 gal.)	bbl.	5.40
TIN—Crystals	lb.	.22
URANIUM—Oxide	"	2.25@3.00
ZINC—Metallic ch. pure	"	.07@.09½
Chloride solution, com'l	"	.02½
Chloride, granular	"	.04½@.04½
Dust	"	.05½@.05½
Sulphate	"	.02@.02½

The Rare Earths.

BORON—Nitrate	lb.	$1.50
CERIUM—Nitrate	"	12.00
DIDYMIUM—Nitrate	"	45.00
ERBIUM—Nitrate	"	67.50
GLUCINUM—Nitrate	"	13.50
LANTHANUM—Nitrate	"	56.00
LITHIUM—Carbonate	"	1.50
LITHIUM—Nitrate	oz.	.60
STRONTIUM—Nitrate	lb.	.07@.07½
THORIUM—Nit. 49@50%	"	4.50
URANIUM—Nitrate	oz.	.25
ZIRCONIUM—Nitrate	lb.	10.00

Note—These quotations are for wholesale lots in New York, unless otherwise specified, and are generally subject to the usual trade discounts. Readers of THE ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable.